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CONSTRUCTION ON THE PATHFINDER DAM, NORTH PLATTE PROJECT, U. S. RECLAMATION SERVICE.

By E. H. BALDWIN,* M. Am. Soc. C. E.

One of the larger masonry dams under construction by the U. S. Reclamation Service is the Pathfinder Dam. This is being built near the central portion of Wyoming, in a granite canyon on the North Platte River, 3 miles below the junction with the Sweetwater River and 45 miles southwest of Casper, a town of about 1,000 inhabitants, on the Chicago & Northwestern Ry. The canyon at the dam-site is about 190 ft. deep, 80 ft. wide at the bottom and 180 ft. at the top, the sides being almost perpendicular for the upper 100 ft. The surface of the ground at the top of the canyon is comparatively level, affording admirable conditions for the construction of a large structure, giving ample room for the necessary plant and for storage purposes.

The North Platte River has a drainage area above the dam of approximately 10,500 sq. mi., the greater part of the water coming from the Continental Divide and from other ranges surrounding the North Park in Colorado and the Encampment country in southern Wyoming. The average yearly run-off is about 1,500,000 acre-feet. During the flood season a maximum flow of about 13,000 cu. ft. per sec. is reached, while the minimum flow is about 400 cu. ft. per sec. The temperature in the vicinity of the dam varies from a maximum of about + 100° to a minimum of perhaps — 40° F., though such extreme temperatures are rare and for very short periods.

During the season of 1905, and preliminary to the letting of the contract for the construction of the dam, a tunnel 480 ft. long was driven by the Kilpatrick Bros. & Collins Contracting Co. While the dam is being built the river is diverted through this tunnel, which will serve as the outlet for the water in the reservoir, and the discharge will be controlled by two sets of gates operated in separate shafts. The cross-section of the tunnel is about 10 × 13 ft., the bottom and the lower 2 ft. on the sides being lined with concrete. Two shafts, about 185 ft. in depth, were constructed with the tunnel; the upper shaft contains the high-pressure emergency gates described in Engineering News, Jan. 2, 1908. This set of gates was installed during the past winter and has been successfully operated by hand, the gate-house not being ready to receive the operating machinery. The gate castings are concreted into a chamber, excavated for the purpose, at the junction of the shaft and tunnel, and the shaft is lined with concrete to the floor of the gate-house above, the cross-section being that of an ellipse with minor and major axes of 8 and 16 ft., respectively. At some future time it is intended to install regulating gates in the lower shaft, but for the time being it will be capped with a reinforced-concrete cover.

THE SITE OF THE PATHFINDER DAM, LOOKING UP-STREAM, JAN. 31, 1906.

In order to care for the low-water flow of the river while the emergency gates were being installed, which necessitated the closing of the upper end of the tunnel, two lines of 36-in. cast-iron pipe were built through the dam, the elevation of the invert of the pipes being about 5 ft. above the bottom of the tunnel. To still further prevent the water from reaching a height sufficient to endanger the temporary bulkhead placed at the entrance to the tunnel, also to prevent the dam being flooded and thereby cause suspension of masonry work, an opening was built through the dam about 15 ft. above the pipes. This opening is 4 × 4 ft., with a semicircular top, except at the entrance, where it is considerably enlarged.

The contract for building the dam was awarded Sept. 1, 1905, to the Geddis & Seerie Stone Co., of Denver, Colo. The total price was something in excess of $600,000, which, in addition to the dam proper, includes the construction (see plan, Fig. 1) of the gate-house, spillway dams, guide wall and the hauling of cement from Casper to the dam-site.

At spillway level the dam will impound 1,000,025 acre-feet, or 326,000,000,000 gals. of water. It is being built of cyclopean rubble and will have the dimensions given in the table on p. 462.*

When sufficient plant had been received to begin operations, work was commenced on the temporary diversion dam (late in 1905). On account of the river bottom being studded with large boulders and rock fragments from the canyon walls, it was not considered feasible to use sheet piling, so a rock-fill dam, faced with gravel, was decided upon. Much of the excavation from the tunnel approach was dumped into the river to aid in making this dam, and a large quantity of rock was blasted from the canyon walls for the same purpose. Sufficient rock was placed to divert the greater portion of the river through the tunnel, but even after the rock was faced with a large quantity of earth and gravel the leakage was considerable. This was partly due to the fact that the work was done in winter, the cold was excessive, anchor ice forming over the crevices between the rocks and preventing the finer material from entering. To get rid of this undercurrent a trench was excavated a short distance down-stream from the rock-fill dam, as deep as possible, and in it a sand-bag core was built nearly to the level of the diversion dam. This core was back-filled with gravel and cut off considerable of the seepage. Below the sand-bag dam a similar dam was built, but not as high, and on it a timber flume 2.5 × 2.5 ft., 260 ft. long, was built

*Engineer-in-Charge, U. S. Reclamation Service, Pathfinder, Wyo.

*The original plan called for a dam about 226 ft. long, terminating at bastions at either end, with a guide wall at each side of the canyon to carry the waste water away from the toe of the dam; during the past winter the design was considerably modified; both bastions and the southerly spillway and guide wall were eliminated and the dam carried out on the south side to the full height. Minor changes will yet be made in the plan of the southerly extension of the dam, but it will not affect the height or length.

DIMENSIONS OF THE PATHFINDER DAM.

Elevation of spillway above sea level....in feet...		5,850
Elevation of top of dam.....	" "	5,860
Total height of dam, from lowest point of foundation to top of parapet.....	" "	218
Thickness of dam at top.....	" "	10
Thickness of dam at bottom.....	" "	94
Length of dam, maximum.....	" "	*425
Radius of arch.....	" "	150
Batter of up-stream face.....	per cent.	15
Batter of down-stream face.....	per cent.	25
Approximate amount of masonry.....	cu. yds..	58,000

across the area to be excavated for the foundation, terminating at a second temporary dam, built below the dam-site to prevent back water flooding it. This flume carried the seepage from the upper dams. Three 6-in. centrifugal pumps, operated by electric motors and discharging into the flume, were sufficient to handle the seepage from the lower sand-bag dam, on which the flume rested.

Excavation for the foundation was pushed as rapidly as possible, but the extreme cold weather greatly delayed operations, as it was necessary to excavate large quantities of ice as well as rock, gravel and other loose material. An excellent foundation was eventually secured, at a reasonable depth. The lowest point in the foundation was about 21 ft. below mean low water and about 14 ft. below the bed of the river. The average depth of excavation over the entire foundation was only 10 ft. Rock suitable for masonry work was saved while all other material was dumped outside the temporary dams to strengthen them. The foundation would have been ready for masonry laying early in April, 1906, but on account of high water coming earlier, and lasting longer, than usual, this portion of the work had to be abandoned for about four months. Consequently it was Aug. 15, 1906, when the first stone was laid.

A very efficient plant was installed (Fig. 2). This includes 10 guy derricks, with 60-ft. masts and 55-ft. booms, 10 double-drum hoisting engines, four boilers with a total capacity of 200 HP., two cableways with spans of 350 ft., operated by Lidgerwood engines and having capacities of 10 and 15 tons each, one air compressor, three steam drills, one No. 4 Gates crusher with elevator and screens, one No. 2 Ransome concrete mixer, one Iroquois mortar mixer, three 6-in. centrifugal pumps with electric motors, one 35-KW. generator and one 85-HP. stationary engine which operates the generator, crusher and all the machinery in the mixing house.

The arrangement of the plant is such that operations can be carried on with a minimum amount of labor. The main power supply is obtained from three horizontal boilers. These are connected to a 9-in. main steam line which supplies all machinery except that used in the face-stone quarry, which is somewhat isolated and is supplied from a separate boiler. The four derricks on the dam are operated by engines placed at the edge of the canyon walls, so that the enginemen can overlook the work. The mixing house is so arranged that the cement is received on the upper floor, where there is storage room for 800 bbls. From the storage room the cement is dumped into chutes that carry it to the concrete or mortar mixer on the floor below. The bins for sand and broken stone are also on the upper floor, and by a system of levers the man in charge of the mixing readily obtains the material wanted, automatically measured. Water is piped from a large storage tank to the mixing house and connected to the mortar and concrete mixers. When mixed, the concrete or mortar is dumped into sheet-iron skips that are placed on flat cars running on tracks on the ground below. This arrangement enables one man to handle something over 700 sacks of cement in a day of 8 hours and a second man to mix an equal amount into mortar and concrete in the same time.

The economical handling of material is further assisted by a very complete industrial railway system. Railroad tracks run fr[illegible] the cement storage shed and main quarry [illegible] the mixing house, crusher and cableways. [illegible] tracks are laid with a slight down grade in [illegible] direction of the load so that a few men can [illegible] without difficulty, push a car loaded with a [illegible] stone to a point beneath the cableway wh[illegible] picks it up and lowers it onto the dam. All [illegible]erial is delivered on the dam by the cableway[illegible], the larger one handling stones, spalls, etc., wh[illegible] the smaller one handles the mortar and concrete. Tracks beneath the mixing house extend under the cableways; when a batch of mortar or concrete is mixed, it is run out beneath a cableway, picked up and delivered to one of the derricks on the wall.

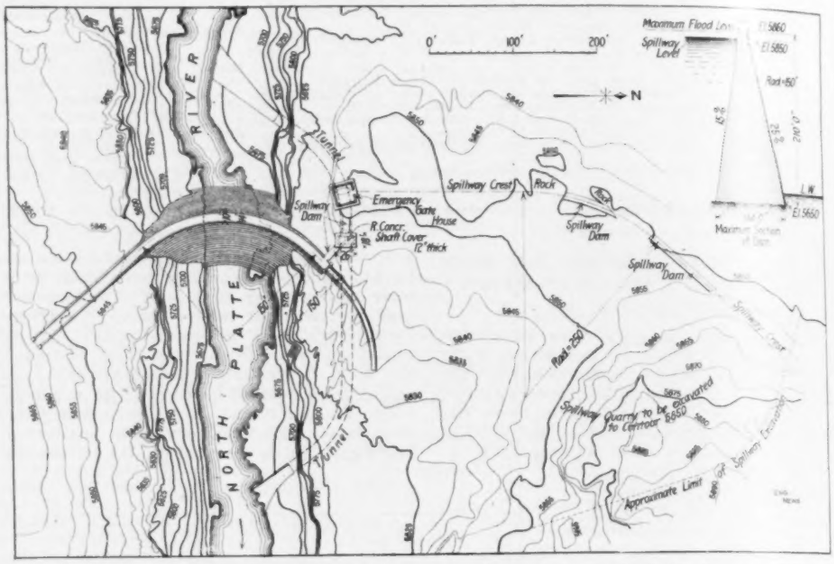

FIG. 1. GENERAL PLAN OF PATHFINDER DAM AND SPILLWAY AND CROSS-SECTION OF DAM.

The method of construction is perhaps somewhat unusual, particularly in the manner in which concrete is used. Both faces of the dam are built of selected stone, roughly cut to give vertical and horizontal joints not exceeding 2 ins.; the up-stream face is laid in 2:1 mortar, while in the down-stream face 2½:1 mortar is used. After leveling up, a course is laid on each face. Then backing stone, varying in size from 1 to 10 tons, with perhaps 4 tons for an average, are set closely together, on a heavy bed of 2½:1 mortar and the vertical joints filled with concrete, mixed in the proportion 1:2½:4, very wet and worked into place with shovels.

The main body of the dam is constructed of broken range rubble, laid to break joints and thoroughly bond the work in all directions. The quarry furnishes stone of very irregular shape, and generally with rough beds which require spalling up. The wall is kept as rough as possible, adjacent stones being usually of unequal height. With this exception, that no vertical joint shall be less than 6 ins., the stones are placed as closely together as possible. When a considerable area has been covered with backing stone, a concrete gang starts at one end of the area thus prepared, filling the vertical joints and leveling up for another layer of stone. The concrete is placed in layers of about 1 ft., the exact depth depending on the height of the vertical joints formed by the lower backing stones. As the backing stones will average from 3 to 4 ft. high, it takes three or four layers of concrete to cover a stone, but as adjacent stones are of varying heights small beds are formed with each layer of concrete but always in a new position on the wall; in this way joints are broken vertically and a thorough bond secured.

Spalls and one-man stone are floated in the concrete where the mass is sufficient to allow of it, but are never permitted to come above the concrete, as by so doing they would spoil the bed for another stone. The concrete is mixed in batches of 1 cu. yd., dumped into vertical

FIG. 2. CONTRACTORS' PLANT FOR THE PATHFINDER DAM, AS SEEN FROM THE SOUTH SIDE ON SEPT. 14, 1908.

joints and carefully worked into all crevices; the lower portions of joints that are small and deep are first filled by shoveling directly into them, then the upper portion is filled by dumping.

With the exception of building the derrick on account of the rock excavation on canyon walls being behind, the entire wall is carried as nearly level as possible. The governing idea

FIG. 3. GENERAL VIEW OF PATHFINDER DAM, LOOKING UP-STREAM, SEPT. 14, 1908.
(The top of the dam, proposed, will be 10 ft. above the top of the derrick masts.)

in placing all masonry, whether of stone or concrete, is to have all voids thoroughly filled, for in no other way can leakage be prevented, especially where the section of the dam is as light as the one under discussion. Also, to use as large a percentage of stone and as little concrete as possible, thereby saving cement, the average cost of which at the Pathfinder Dam is about $6 per bbl. During the past spring, when the water was 90 ft. deep at the upper face, there was no trace of dampness on the lower face.

Backing stones are not placed on a bed prepared as above until the concrete has thoroughly set. Before placing the mortar bed for a stone the area to be worked on is thoroughly swept and then wet with a hose. If there is any suspicion of dirt the area is washed. A heavy bed of mortar is then spread that will cover a little more area than the bed of the stone selected. The bottom of the stone is inspected for dirt, seams or scales, and, if satisfactory, is wetted and lowered onto the mortar bed and shaken down with iron bars, one at each end, working opposite. If the bed of the stone was fairly even and the shaking down did not show a "hard spot," the stone was considered set, surplus mortar picked up and the bed joint finished off by the second mason. If the bed of the stone was somewhat rough, as is generally the case with the stone furnished by the spillway quarry, after the stone was shaken down to make an impression it was raised by the derrick, spalls were placed in the mortar where needed and hammered down, hard spots in the concrete (if any) were dug out, a light coating of mortar spread over the bed and the stone shaken down again. If it floated when rubbed down it was considered set. Usually, after the masons became skilled in the work, it was seldom necessary to lift a stone more than once, unless the bed of the stone was particularly rough, in which case it often had to be raised several times.

While the capacity of the plant is about 200 cu. yds. of masonry in 8 hrs., and could be increased to 250 cu. yds. by lowering stone and spalls at night, the maximum quantity of masonry laid in one month was 5,040 cu. yds., or 168 cu. yds. per day. Several unavoidable conditions and circumstances exist that limit the progress of masonry laying. Where the ends of the dam connect with the canyon walls considerable excavation is necessary, partly on account of seamy and disintegrated rock, but at the north end mainly to obtain a satisfactory bond, the canyon wall at this end making quite an angle away from a radial plane to the end of the dam.

The horizontal area of the dam is so small that it can be worked over in a day, and as concrete placed in the morning is seldom hard enough to lay stone on before night nothing would be gained by increasing the force. The maximum monthly progress cannot be made regularly, as the derricks on the wall have to be raised every six or eight weeks, which causes a delay of from six to eight days. On account of high water, work on the dam could not be carried on for several months during the seasons of 1906 and 1907. During the cold weather, from the middle of November until the first of March, masonry work was impossible; this gave a working season of from five to six months. While work in the quarries, spillway, etc., was carried on during this period of enforced idleness at the dam, the force was somewhat disorganized and the completion of the work considerably delayed.

At the north end of the dam (Fig. 1) is a natural spillway, about 450 ft. long and, with the exception of two small depressions, the rock surface is approximately at the elevation selected (5,850) for the spillway level. As a spillway length of at least 600 ft. was desired, it was decided to excavate the rock at the north end of the spillway to Elev. 5,850 and use it in the construction of the dam, thus obtaining an adequate wasteway at practically no expense. This is called the main, or spillway, quarry; it is now excavated to give a spillway length of about 650 ft. The rock in this quarry is not suitable for face stone, being somewhat seamy and hard to work. It is now used wholly for backing and in the crusher for concrete material. Two other quarries have been opened for face stone. No. 2 furnishing some backing stone also, while No. 3 furnishes face stone only.

Portland cement is used exclusively. It is furnished by the United States and delivered to the contractors at Casper, Wyo., which is the nearest railway station. The hauling of the cement to the dam-site is quite an item and furnishes work for a large number of teams. Freighting outfits of all kinds and sizes are used, from a sheep wagon drawn by two horses and a mule and carrying 24 sacks of cement, to a string team of 22 horses drawing five wagons coupled together and hauling 327 sacks of cement, weighing 31,000 lbs. A typical string team, of a size that has given the best satisfaction, consists of 16 horses drawing three wagons and carries 250 sacks of cement. Storage room at the dam has been provided for 15,000 bbls. of cement, and at one time was completely filled.

At the end of this season the dam will be completed to Elev. 5,830, which is 184 ft. above the lowest point of the foundation and 34 ft. below the top of the parapet wall. The contract time expires Aug. 1, 1909, and the dam will undoubtedly be completed before that time.

The Pathfinder Dam is a portion of the North Platte Project, of which Mr. Chas. E. Wells, M. Am. Soc. C. E., was Supervising Engineer until December, 1907, since which time the project has been under the supervision of Mr. I. W. McConnell, Assoc. M. Am. Soc. C. E.

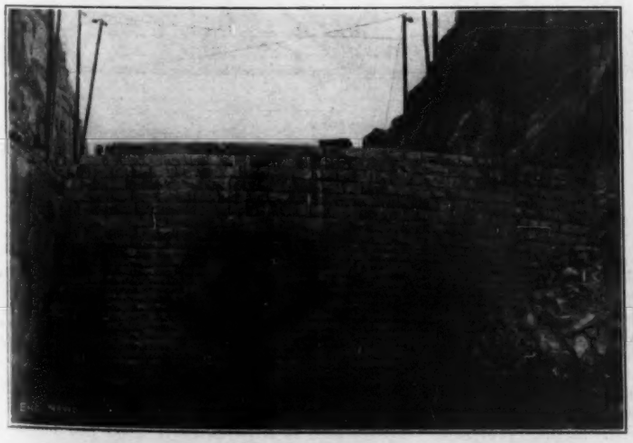

FIG. 4. SHOWING MASONRY FACE, UPPER SIDE, IN DETAIL, APRIL 27, 1908.

FIG. 5. DAM IN FLOOD, SEEN FROM BELOW, JUNE 8, 1907.

A COMBINED CONCRETE AND STEEL GIRDER BRIDGE, MONROE ST., BROOKLAND, D. C.

By W. J. DOUGLAS,* M. Am. Soc. C. E., and W. P. DARWIN, Assoc. M. Am. Soc. C. E.

The Monroe St. bridge, crossing the double tracks of the Baltimore & Ohio R. R. at Brookland, a suburb of Washington, D. C., consists of concrete abutments with a girder superstructure of a combination of concrete and steel somewhat different from the usual type of reinforced-concrete girder bridge. In this superstructure the steel is first erected and is so designed that it takes directly a certain portion of the total load as well as acting as a support for the concrete forms during construction, thus precluding the necessity for falsework which might obstruct the railway right-of-way beneath.

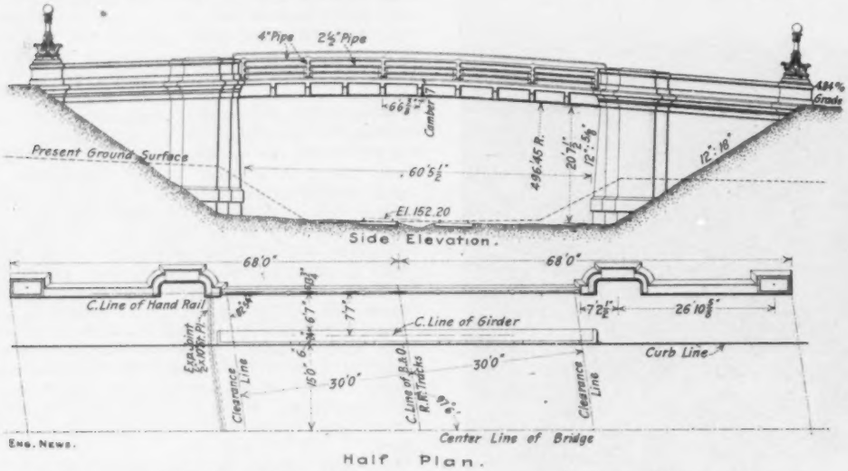

FIG. 1. ELEVATION AND PLAN OF MONROE STREET BRIDGE, BROOKLAND, D. C.

The superstructure (see Fig. 1) consists of two 61-ft. 5½-in girders, made up of steel Howe trusses, completely encased in concrete, carrying the 30-ft. roadway on a reinforced-concrete slab resting on concrete-encased built-up steel floor beams which are riveted, every 6½ ft., to the trusses. The sidewalks, 6½ ft. wide on each side, are reinforced-concrete slabs carried on concrete brackets, reinforced, as shown in the figures, by self-supporting angles and round rods. The only exposed metal on the bridge is in the heavy iron pipe railings on the outer edge of each sidewalk.

The abutments are U-shaped, of heavy concrete masonry with rather ornamental pilasters at each end, guarded by concrete railings (Fig. 6.) The foundations of these abutments were strengthened with concrete piles, along the outer perimeter of the footings, where the maximum pressure obtains. The soft clay foundation was figured safe for 1½ tons per sq. ft., but the pressure on the toe of the walls reached 2½ tons, so some additional support was thought necessary.

On account of the more satisfactory appearance obtained with the arch than with any other form of bridge, an arch bridge was first thought of for this site, but in order to meet the conditions of clearance over the railway tracks and of the street grades, it became necessary to adopt a form of bridge similar to a plate girder. It will be noticed in Fig. 1 that the concrete girders are curved so that the grade of the roadway gives a transition curve between the tangents of the approach grades. The abutment coping is tangent to the roadway curve. This was mandatory in order to give a maximum clearance with a minimum street grade. For a similar reason it was desirable to make the floor system as shallow as possible.

An intermediate girder was not deemed economical, as it was very objectionable from an esthetic as well as practical standpoint. In narrow plate-girder bridges the use of three girders, cutting the roadway into two parts, while giving a floor system of less depth, reduces the efficiency of the bridge of the through type, because frequently it is desirable to haul across the bridge, loads having widths between 14 and 17 ft., so that where the three-girder through type of bridge is used there should be a clear width in each roadway of 20 ft. in order to accommodate loads having much greater widths than the average load.

The dimensions and make-up of the steel framework may be readily understood from the drawings; the theory of the distribution of the load and the computation of the stresses need some further explanation. Before designing the reinforcement for the main girders, careful consideration was given to the various customary forms of reinforcement, and after this consideration the existing type was adopted because of its ease of erection. The reinforcing trusses were fabricated complete at the shops and were placed in position by means of the two derricks which had been previously employed in the construction of the abutments. The comparative certainty with which the stresses could be calculated, the certainty of having the steel located in the actual construction in accordance with the theoretical relation to the concrete, the positive anchorage obtained for all members, particularly as to the connection of the web members and the girder reinforcement, the simplification of the form work, the decreased cost of depositing concrete, and the great saving in the cross-section of the steel compression members on account of stressing the steel in compression to approximately 16,000 lbs., are all factors in favor of this type of construction.

It was assumed that the forms for the entire structure were to be suspended from the steel reinforcement of the girders and floor beams. In addition to the dead load the bridge was designed to carry a uniform live load of 150 lbs. per sq. ft. over the roadway and 100 lbs. per sq. ft. over the sidewalks with further provision for an 18-ton road roller and a 30-ton derailed electric car. The girders were so designed that the maximum unit stress in the completed structure, due to live and dead loads, would be 16,000 lbs. in the steel and 500 lbs. in the concrete. The steel in tension was designed to take all the tension stresses and the steel in compression to take all of the hereinafter described "primary stresses" and such part of the balance of the stresses as could enter into the steel in compression reinforcement, on the basis of the ratio of the moduli of elasticity of the concrete and the steel.

In the customary designs for girders on the basis of 500 lbs. per sq. in. compression of concrete and a ratio of moduli of elasticity of 12, the steel in compression can only be stressed up to 6,000 lbs. per sq. in., or assuming a ratio of 15 the steel can only be stressed up to 7,500 lbs. per sq. in.; therefore, by adopting the design in question, the steel in compression has been cut down to something more than half, which results in a considerable saving.

In the design, the loadings on the girders were divided into two sets, which for convenience we will term "primary" and "secondary." The primary loads consisted of the weight of the steel, the forms, the concrete of all floor beams up to the bottom of the slab, and the green concrete of the girders. The secondary loads consisted of the roadway and sidewalk floor slabs, the roadway asphalt and the live load. In order to get the theoretical primary stresses into the main girders it was necessary to concrete the beams of the roadway and sidewalks before concreting the main girders. Then the main girders were concreted, and when they were about seven days old the balance of the concreting was executed. In order to simplify the calculations, the compression members (the girders being assumed as trusses for convenience of calculation), were treated as reinforced-concrete columns. The area of the concrete in the top chord was assumed as 24 × 24 ins., a little less than the area of the upper third. The area of the compression diagonals was figured on the basis of an area of 20 × 18 ins. The steel in the compression flanges of the 24-in. built-up I-beams was of smaller section than the steel of the tension flanges, due allowance being made in the design for the compressive value of the concrete. Bronze bedplates shown at ends of girders were provided in order to carry out the idea of complete steel protection.

Forms for the superstructure, in that portion of the floor system directly over the railway tracks, remained in place for 40 days to protect the concrete from the impact of the locomotive cinders. The flexure of the floor beams under the slab load was ¼-in.; that of the main girders after jacketing was also ¼-in. The end of the cantilever brackets of the sidewalks deflected about the same amount under the dead load of the concrete.

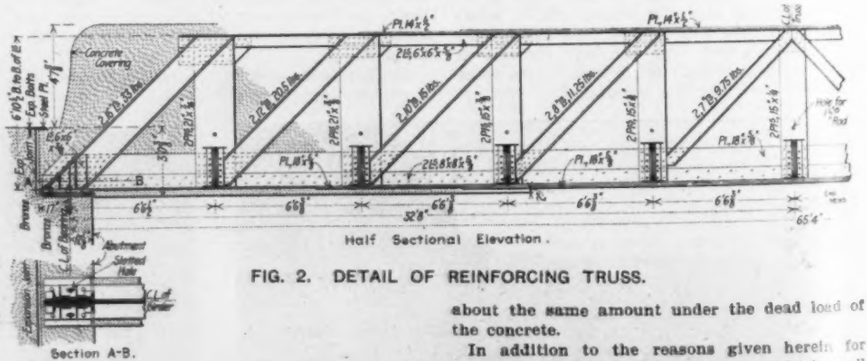

FIG. 2. DETAIL OF REINFORCING TRUSS.

In addition to the reasons given herein for the type of reinforcement used, it might be well to state that it is believed that ultra-conservative engineers who stress the steel in reinforced concrete to low values, with the design adopted, would be willing to increase these values because of the somewhat greater certainty of the mechanics of the design. In large girders for bridges, which are exposed to the elements, it is thought that this method of reinforcement and construction is a particularly good one because the amount of flexure in the girder is cut down

*Engineer of Bridges, District of Columbia.

to a minimum (after the girder concrete has set), therefore the possibility of the formation of incipient cracks in the tension flange of the concrete is cut down also to a minimum. Whether or not these tension cracks of exposed girders are important is a matter of conjecture rather than fact, but where locomotive gases and rain water threaten the life of the metal these incipient cracks are worthy of some consideration. It is further believed that this system will result in great saving in long-span high reinforced concrete trestles where the cost of supporting the form work enters largely into the total cost.

FIG. 3. VIEW OF MONROE STREET BRIDGE.

The original estimate for this bridge was made on the basis of abutments of sandstone backed with concrete and a superstructure of unprotected steel, with a solid floor. This estimate for the work was $44,000; the actual cost of the bridge as built was $35,000. This will show the possibility of getting a reasonably sightly design in concrete without increasing the cost over that of the old-fashioned inartistic bridges in stone and steel.

The bridge was designed and constructed in the office of W. J. Douglas, M. Am. Soc. C. E., Engineer of Bridges, District of Columbia; W. P. Darwin, Assoc. M. Am. Soc. C. E., Assistant Engineer, under the direction of Maj. Jay J. Morrow, U. S. A., M. Am. Soc. C. E., Engineer Commissioner, and Capt. E. M. Markham, Assistant Engineer Commissioner, D. C., and Mr. C. B. Hunt, M. Am. Soc. C. E., Engineer of Highways. The contractor was C B. Clark & Co., of Baltimore.

A REPORT ON AUTOMATIC STOPS AND CAB SIGNALS FOR STEAM RAILWAYS.

In accordance with the instructions received from the executive committee, sub-committees were appointed at the first meeting held in January to formulate reports on,

1. Various cab signals and automatic stops which are worthy of recommendation.
2. Proper location of automatic stop trips for varied conditions of traffic.
3. The advisability of the use of cab signals as a substitute for fixed signals or adjuncts thereto.

In order that the committee might become informed regarding the latest state of the art, and secure the assistance and cooperation of inventors and manufacturers of automatic stop and cab signal devices, a letter was published in the technical journals asking those interested to send to the committee plans, descriptions and specifications of their devices. Arrangements were made that specifications received were to be forwarded to each member of the committee in turn in order that comments might be made thereon and sent to the chairman. Few specifications were received and the recommendations of this committee have been based upon the knowledge and experience of the members rather than upon a study and consideration of the descriptions of automatic stops and cab signal devices which have been submitted.

HISTORICAL.

Automatic stops were probably thought of and invented shortly after the introduction of the air brake. The negligence or incapacity of enginemen had resulted in a number of accidents which would not have occurred if an automatic device had been used to apply the brakes and stop the train in the event of a failure of the engineman to obey the signals. A number of patents have been issued for automatic stop and cab signal devices. Many of the devices are so much alike that a decision of a court would be required to determine the particular merit or invention which each patent is assumed to possess. A majority of the designs show the inventor to be ignorant of the conditions under which a device of the kind must be used. Comparatively few of the devices which have been patented have been tried, and this committee is not aware that any of these have passed the experimental stage and are in regular use on a surface road in the United States.

Automatic stopping devices are in successful use on the Boston elevated, Chicago elevated, New York elevated, New York subway and the Hudson tunnel roads. On these roads, snow and ice do not collect in sufficient quantity to interfere with the working of the apparatus, and the road clearances are ample for the construction used. The results have shown the automatic stop to be a valuable safeguard and to have prevented a number of collisions that might have resulted in a loss of life.

Of the automatic stop and cab signal devices which have been given the most extended trial in the United States, might be mentioned the Miller cab signal, the Kinsman automatic stop, the Rowell-Potter safety stop.

Descriptions of these devices may be found in the following publications:†

Miller Cab Signal—Railroad Gazette, pp. 128, 172, 219, 206 and 207, year 1902.

Kinsman Automatic Stop—Railroad Gazette, p. 400, June 8, 1894; Railway & Engineering Review, p. 211, March 14, 1908.

Rowell-Potter Safety Stop—Railway & Engineering Review, p. 65, Nov. 2, 1895; p. 2, Jan. 6, 1900; p. 190, March 15, 1902; Railroad Gazette, p. 547, 1894; p. 378, 1902.

In England and on the continent, cab signals are in use on several roads, there being a need of these on account of the dense fogs, and the unsatisfactory service and large expenditure required for fogmen. No attempt has been made to use a train control device in connection with the cab signal, as the discipline is such that operating officials do not believe the use of the stop to be advisable or necessary. So successful have the cab signal devices been, the board of trade of England, at the recommendation of Col. Yorke, have allowed roads using an approved form of cab signal to dispense with the distant signal, and it is the understanding of your committee that this has been done by one or more roads in a number of instances.

The cab signal systems, as used in England, are of the intermittent contact rail type and similar to a number that have been tried in this country. A full description of the Raven cab signal, which is used on the North-Eastern road, was published in the "Railroad Gazette" of Feb. 14 and 21, 1908. From the trials made on American roads, it is evident that devices of the type used in England cannot be made to work in this country on account of ice and snow forming on the contact rails sufficiently to prevent a contact being made between the part on the engine and the part fastened to the track.

DESCRIPTION OF TYPES.

Automatic stops and cab signals may be divided into four general classes based upon the method used in

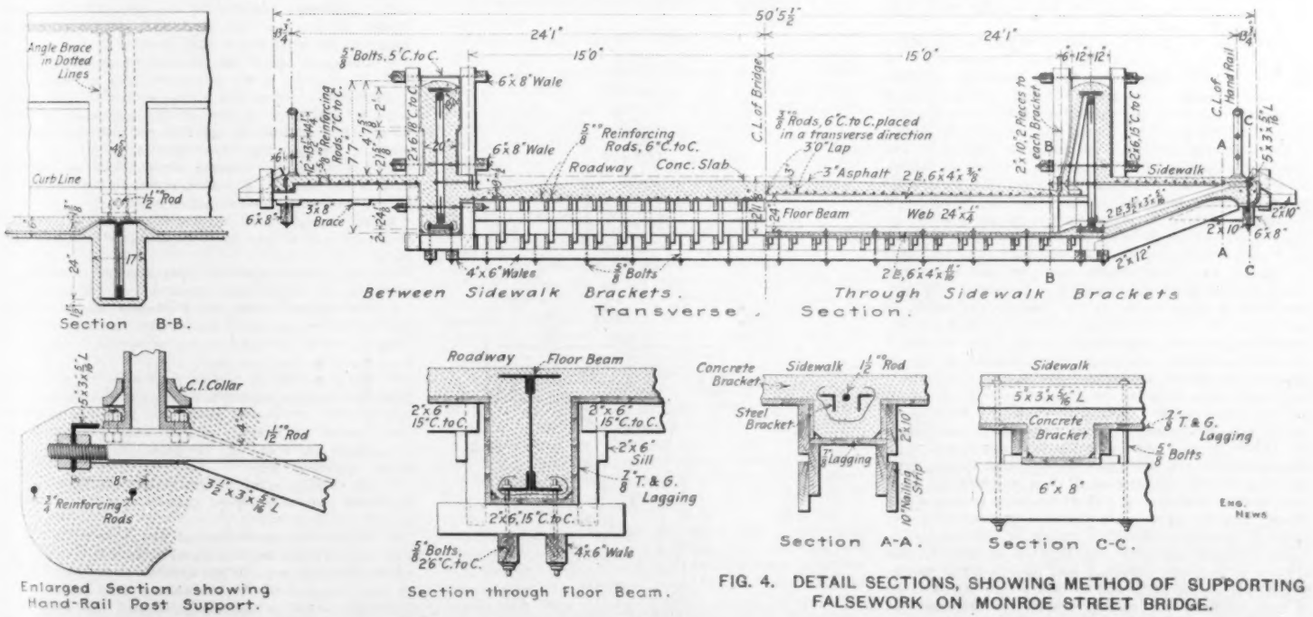

FIG. 4. DETAIL SECTIONS, SHOWING METHOD OF SUPPORTING FALSEWORK ON MONROE STREET BRIDGE.

*Report of a committee to the Railway Signal Association, Oct. 13, 1908.

†Information concerning the Miller system was published in Eng. News, Vol. XLVI., p. 113; Vol. XLVIII., pp. 523 and 527; Vol. XLIX., pp. 1, 15. The Rowell-Potter safety stop is described in Eng. News, Vol. XLII., pp. 327 and 354.—Ed.

transmitting to the engine or moving train the impulse necessary to operate the automatic stop and give a signal indication in the cab. These with their various subdivisions are as follows:

Mechanical Trips.
  Overhead.
  Ground.
Insulated Engine Parts.
Contact Rails.
  Continuous.
  Intermittent.
Inductive.
  Alternating Current.
  Hertzian Wave.

MECHANICAL TRIPS—OVERHEAD ARRANGEMENT.—Devices of this type are most generally arranged to transmit to the moving train the operating impulse to apply the automatic stop by means of a hanging arm or weight arranged to strike a valve or handle placed on the top of the cab or car and apply the air, in case the signal should be passed when in the stop position.

These systems must of necessity be arranged for the hanging arm or weight to come within the maximum clearance line, and in such position would be apt to strike, with probably fatal results, a man riding on the top of a car. The absence of the arm will result in a failure to stop a train when a signal which in indicating stop is run by. Up to the present time, as understood by the committee, these devices do not conform to several of what they regard as essential requirements for a safe and reliable automatic stop and cab signal system. These requirements have been given at the end of this report and the overhead arrangement of mechanical trip, automatic stopping devices do not comply with Nos. 1, 2, 3, 4, 6, 7 and 11.

MECHANICAL TRIPS—GROUND ARRANGEMENT.—Devices of this type are arranged with a movable arm or inclined plane, which when in the operating position is made to come in contact with parts suitably located on the moving train and cause the brakes to be applied, when the train runs by a signal that is indicating stop.

The difficulty met with in operating devices of this type is that the parts on the ground or those on the engine must extend inside of or beyond the permissible clearance lines, in which position they are likely to be broken or knocked out of place, for the parts placed on the ground and the parts on the train are likely to be hit by objects other than the engaging arm, and the brakes be applied when they should not. Ice and snow seriously interfere with the operation of devices of this kind, and these systems, so far as the committee is aware, do not at present meet requirements Nos. 1, 2, 3, 4 and 7.

INSULATED ENGINE PARTS.—With these systems it is usual to insulate one truck from the other of the engine or car, insulate an engine from its tender or insulate one wheel from the other by means of a split axle or insulated wheel center. Pressed fiber is the material by which this insulation is most generally accomplished. With any of the above-mentioned arrangements it is necessary that the indication be conveyed to the moving train during the interval of time in which the insulated part is passing over a short insulated section of rail or an insulated joint in the track. The operating impulse is, therefore, momentary and is not continuous.

The principal difficulty met with in systems of this kind is to properly construct and maintain the insulation of the engine parts and to insure that the parts on the moving train will operate properly in the short interval of time available. These systems, it has been found, do not conform to essential requirements Nos. 1, 2, 3 and 11, as recommended by the committee.

CONTACT RAILS—CONTINUOUS TYPE.—Devices of this type are arranged to conduct the operating signal impulse to the moving train by means of a shoe attached to the train making contact with a third rail placed alongside of the main rail, between the main rails, or above, or on the side of the train.

The difficulty experienced with devices of this type is to secure a continuous contact on the third rail, for, unless this is done, the device operates and the brakes are applied when there is an opening in the third rail, irrespective of whether or not the operating conditions make it necessary or desirable that the train brakes be applied.

The continuous type of contact rail system, as at present understood by the committee, does not conform to requirements Nos. 1, 2, 3, 4 and 11.

CONTACT RAILS—INTERMITTENT TYPE.—With these systems the contact is usually of moderate length and is placed at a point where it is desired to convey the operating signal impulse to the moving train. These points are at the commencement of a block, or where a home or dwarf signal is placed. The indication given on the train is continued from the time a train passes one contact to the passing of the next contact, or to one where the indication is changed.

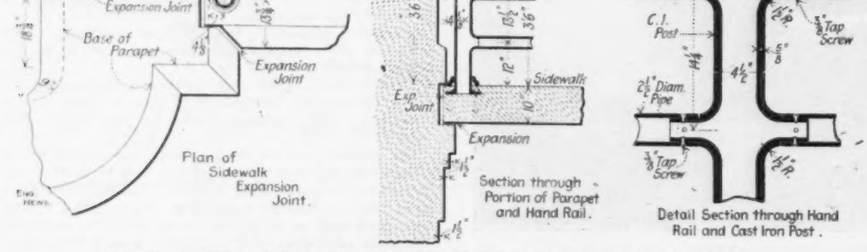

FIG. 5. DETAILS OF EXPANSION JOINT ON MONROE STREET BRIDGE.

The principal difficulty to be overcome in the development and use of devices of this type is to insure that the indication will be received on the moving train, and when received will not be improperly changed before the next contact point is reached.

These systems, as far as developed, do not fully meet requirements Nos. 1, 2, 3, 4, 7 and 11.

INDUCTIVE—ALTERNATING CURRENT TYPE.—The committee is not aware that apparatus of this type has been tried. As described, the system is quite similar to the intermittent contact rail scheme, except that the operating impulse is conveyed to the moving train by induction, a coil of wire attached to the track acting on a suitably arranged coil placed on the train. The arrangement can be made to keep within the clearance lines and seems to be capable of successful development provided the necessary alternating current is available at the many points where same will be required.

Requirements Nos. 1 and 2 do not appear to be complied with by systems of this type of which the committee has knowledge.

INDUCTIVE—HERTZIAN WAVE TYPE.—This type of apparatus makes use of a generating device placed on a train or at a fixed point, from which the Hertzian waves are sent out, preferably in the direction in which it is desired to give the indication. A collector of suitable form and arrangement is placed on the train or point at which an indication is to be received and the proper Hertzian waves are supposed to be collected and actuate the apparatus to give an indication.

The principal difficulty with apparatus of this type is in selecting the particular train or fixed point which is to receive the intended indication and to provide protection for a train when there is a failure of the wave generating apparatus.

It is understood by the committee that these systems do not comply with the following requirements for safe and reliable working: Nos. 1, 2, 3 and 6.

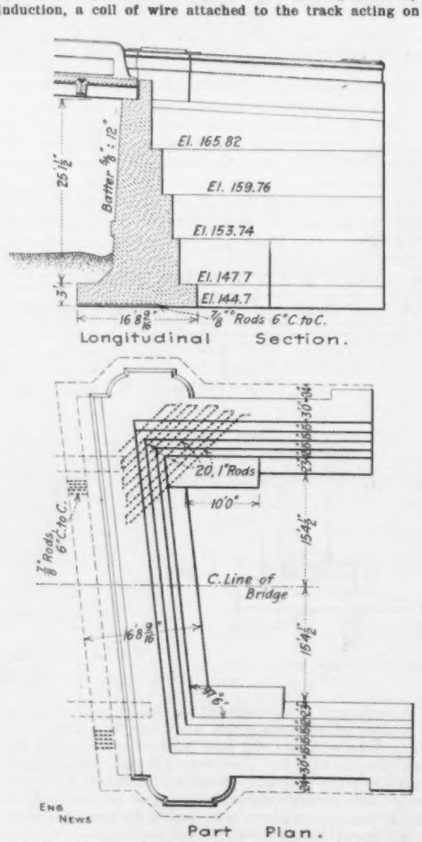

Fig. 6. Abutments to the Monroe Street Bridge, Washington, D. C.

RECOMMENDATIONS.

Up to the present time, descriptions and drawings of automatic stop and cab signal devices referred to this committee have not included those which seem to be the best and the most practicable. Your committee is not in a position to, and does not think it advisable, to recommend for trial any type of cab signal or automatic stop device with which they are familiar, believing that demonstrations of the practical workings of these systems should be made by the patentee, the manufacturer, or under the auspices of the block signal and train control board of the Interstate Commerce Commission.

That those interested in the design and manufacture of automatic stop and cab signal devices for use on surface railroads may know of the operating conditions under which these systems will be used, and the requirements as to safe and reliable working which must be met in order that these devices may have the approval of this association, your committee submits for adoption the following requisites of installation to which automatic stop and cab signal systems must conform, to be considered safe and reliable in operation:

REQUISITES OF INSTALLATION.—1. Apparatus and circuits so constructed that a failure of any essential part will cause the display of a stop signal indication and also the working of the automatic stopping device. The apparatus shall, if possible, be so arranged that the stop shall not be operative or effective at speeds less than 5 miles per hour.

Note: To comply with this requirement, it is practically necessary that circuits be arranged with power supply at one end and controlled relay or operating device at the other end of each circuit.

2. The train control feature must be applicable for use with the absolute or the permissive block system.

With either system the release of the stopping device must be within the control of the engineman or trainman, but only after the speed of the train has been reduced to five miles per hour or less.

3. The automatic stopping device must be operative only in the direction of traffic, except in connection with signals governing reverse movements.

4. The system must be operative under all weather conditions and at any speed in excess of five miles per hour.

5. The system must be adaptable for use with a block system using track circuits.

6. The system where track circuits are used must give protection against a broken rail, the ends of which have separated, or where a rail or section of a rail has been removed from the track.

7. The parts on the moving train must not extend beyond the maximum clearance lines and the parts on the ground must not extend within the maximum clearance lines, except for a space of 2 ft. above the top of the rail, within which distance the parts must clear the maximum equipment line.

8. An overlap equal to the braking distance for the maximum permissible speed must be provided for an automatic stopping device.

9. Emergency application of the brakes should be made only when a home or dwarf signal has been run by, when indicating stop. If the system is arranged to cause an application of the brakes when a train passes a distant signal that is indicating caution, the application of the brakes must not occur if the home signal is indicating proceed, or if the speed of the train is under such control that the train will be stopped before passing the home signal.

10. The circuits must be arranged to allow two or more engines to be used with one train, or to allow one train to push another train without having the automatic stop applied at each home signal, or to require the speed to be reduced to five miles per hour when passing a home signal that is indicating proceed.

11. The automatic stop must be adaptable for use

with electric traction systems, using direct or alternating current for train operation.

12. The automatic stop and cab signal should be considered only as adjuncts to a fixed signal system.

Note: This is on account of the impossibility of properly checking the work of the engineman if a cab signal or automatic stop is used without a fixed signal and also from the necessity of informing the engineman of the exact commencement of the block and the point at which the indication received in the cab shall become effective.

Committee, W. H. Elliott (chairman), A. R. Raymer (vice-chairman), E. M. Weaver, G. D. Fowle, J. V. Young, G. N. MacDougald, W. B. Bullard, G. H. Dryden, E. C. Graham, J. A. Beoddy, W. McC. Grafton, H. J. Foule, D. M. Case, E. E. Mack, Wm. Hiles, A. C. Holden, J. R. Decker, G. W. Hulshizer.

FORESTS AND FLOODS: EXTRACTS FROM AN AUSTRIAN REPORT ON FLOODS OF THE DANUBE, WITH APPLICATIONS TO AMERICAN CONDITIONS.

By Lieut.-Col. H. M. CHITTENDEN,* M. Am. Soc. C. E.

In collecting data for a paper on the influence of forests upon stream flow, published in the September Proceedings of the American Society of Civil Engineers, I made some study of a very exhaustive report upon the great floods of the Danube in 1897 and 1899, prepared by M. Ernst Lauda, Chief of the Hydrographic Bureau of the Austrian Government. In the "Concluding Remarks" of this report the author discusses the relation of forests to floods and gives the most complete chronological record of the Danube floods that has ever been prepared for that or probably any other stream. Believing that these features of M. Lauda's report will be of interest to American engineers at this time, when similar questions are so prominently before the public, I offer the following extracts, and append thereto some criticisms and conclusions based upon conditions in our own country. The paragraphs of the following translation are numbered for convenience of reference in the commentary. I would like to add in my own behalf, without any purpose of criticising the style of this very able report, that certain portions of it were extremely difficult to understand, and I am not sure that a precise equivalent is here given for some of the more involved passages. The translated extracts follow:

(1) A discussion of the causes of floods, such as those here considered, and of the factors influencing their origin and course of action, is not strictly within the province of the hydrographic service; but this report would not be complete without some reference to it, because of the great public interest which the subject has attracted.

(2) Undoubtedly the origin of such occurrences is to be found solely in the reciprocal action of atmospheric phenomena. Although the logical course would be to commence with this branch of the subject, I shall nevertheless consider first certain erroneous beliefs that have crept into the popular mind. For example, it is universally believed that forests have an influence in moderating and preventing floods, and deforestation upon their origin and more frequent occurrence; yet this belief is no better established from a hydrographic standpoint than the entirely unfounded belief that the floods of the past few years in Austria are due to deforestation. Likewise untenable are the frequent assertions that the greater frequency of floods in recent times is the result of artificial interference with stream-flow due to works of river regulation.

(3) No doubt the interests of hydrography are indirectly affected by forests through their property of preserving the earth's surface from denudation and the water courses from sediment; and also through the protection of snow masses deposited during the winter from the action of the sun's rays, the wind and warm rains. These features are enough to warrant the greatest possible development of forestry. Moreover, on account of the slower melting of the snow, less water reaches the streams, and consequently less sediment, and in this way only can the washing away of fertile soil and the terrible devastation of civilized regions be successfully prevented.

(4) But with these benefits, the advantages of forests in controlling floods are exhausted. That forests have a certain retentive capacity in holding back the precipitation is evident from the fact of the greater scarcity of the water in the streams in dry seasons after lands have been cleared up. But this beneficial influence, characteristic of vast forest areas, is local only and can affect favorably only those valleys in the immediate vicinity of the forests. This retentive capacity does not exercise a decisive influence upon the cause, extent and nature of high floods, such as have visited Austria and are the subject of our present consideration. Moreover, this capacity is quickly exhausted during great rain storms, when both atmosphere and soil are saturated with moisture. At such times the forests may even increase runoff over what it would be in the same region if free of forests, for in the latter case considerable quantities of water are lost in evaporation, whereas the foliage of the forests retards this process.

(5) Even admitting the favorable influence of forests as just described, the proof of an equally favorable influence upon the lower courses of the streams could not be regarded as conclusive. For the magnitude of a great flood is very largely dependent upon the coincidence of water-height culminations from the tributaries; and it is easily seen that the retentive effect attributed to forests and the consequent postponement of the flood culminations may augment the flood in the trunk stream, if we consider that the high waters of tributaries may be postponed so that they will arrive in the main stream coincidentally with later culminations from other parts of the drainage area.

(6) Against the popular belief in the favorable influence of forests upon floods resulting from excessive rains may be adduced the interesting fact that lands richest in forests are frequently visited by the severest floods. For example, in 1897 the richly wooded valleys of the Elbe, Iser, Aupa, Neisse, as well as the densely wooded sources of the Wien, Erlauf and Pielach; and furthermore in 1899 the regions of the Traun, Enns, Ybbs, etc., likewise richly covered with forests, were the very ones most affected by the high water catastrophes.

(7) A consideration of precipitation conditions preceding these catastrophes corroborates the conclusions above arrived at. In the great flood of 1897 there fell in the course of two days in the basin of the lower Inn 5.8 ins. of rain; in the basin of the Traun, 7.3 ins.; of the Ybbs, 6.7; Erlauf, 6.8; Pielach, 6.6; Traisen, 6.3; and Wien, 6.8 ins. In the entire storm period of six days (July 26-31) there fell in the basin of the Danube [area not stated] about 425 billion cubic feet of water. In 1899 in a period of seven days there fell 565 billion cubic feet, of which the following depths fell in a period of two days upon the principal tributary area: Salzach, 6.7 ins.; Traun, 8.2; Enns, 7.8; Ybbs, 8.2, and Traisen, 6.6.

(8) The relative quantities of precipitation produced a corresponding relation between the runoffs of the two years, the flood of 1899 considerably exceeding that of 1897 both in magnitude and extent. If we consider the enormous volumes of water which these atmospheric eruptions furnish within a few days for the production of floods, we cannot ascribe to an increase or decrease of forest areas by a few hectares (for this is all it amounts to in an entire river basin) any material influence upon the origin, frequency or behavior of such catastrophes.

(9) There remains to be considered the objection often made against works of river regulation, viz.: that these works increase the frequency and height of floods by causing an artificial interference with the flow of water in the streams. This objection can be answered at once by the single question: Have the frequency and extent of these catastrophes increased in the course of years? They have not. Even the recent lamentable disasters are not unparalleled and must be considered as repetitions of similar occurrences within unforgotten times. As proof of this a retrospect is here given of the floods of the Danube near Vienna from the year 1000 to the present.

(10) Of the eleventh century we have knowledge of only one great flood, that of the year 1012, which destroyed many people and, to use the language of the chronicler, appeared with such violence that the inhabitants of the unfortunate regions had no recollection of anything like it.

(11) More than 100 years later followed the flood of 1118, which brought into these regions such an unusual amount of water, that the same had not been so abundant since the time of the "great flood." According to descriptions, these two catastrophes, as well as the next one, in the year 1126, were probably due to enormous precipitation; whereas those of 1193 and 1194, and probably also that of the year 1195, were due to melting snow.

(12) In the 13th century the year 1210 is especially noteworthy on account of the many lives sacrificed, but in a greater degree on account of the high August waters following a seven days' rain. The "Kornenburg," consisting at that time of two parts, connected by a bridge, was completely destroyed by the floods of the Danube.

(13) In the years 1234 and 1235 the melting of the ice at Wien (Vienna) and Krems caused devastating inundations, and a year later, 1236, the Danube overflowed so violently that for many years no such flood had occurred. The years 1275, 1280, 1281, 1284, 1285 and 1295 were equally noted for their repeated high floods in the summer months; and the year 1280 for the breaking of the ice in the spring.

(14) Of the floods of the 14th century (1312, 1315, 1316, 1317, 1340, 1342 and 1359) that of February, 1342, is especially to be mentioned, as having cost the lives of 6,000 people.

(15) Notably rich in water was the first decade of the 15th century, in the course of which seven high-water years were recorded. The worst of these was the year 1402, which had several floods during the summer. On June 29 the danger was greatest. A moving sea appeared before Vienna and for ten days the water remained at the same height. Dearth and famine followed and continued for a long time. The years 1404, 1405 (June), 1406, 1407 and 1408, and finally the year 1409 caused additional damages.

(16) After 25 years of rest the Danube, in the year 1434, rose so high that the Lobau and all the other islands and meadows stood entirely under water and scarcely the highest trees of these islands projected above the flood. On Feb. 17, 1439, the stream rose so high through the melting of the ice that many people lost their lives and many others their possessions. The Chroncile of Krems reports that the breaking up of the ice on Ash Wednesday night drove the floods of the Danube across the city walls and drowned 70 people.

(17) A singular event is reported for the year 1445: On Ascension Day [early in May] and repeatedly for three days thereafter snow fell, after which great showers followed.

(18) In 1464 the Danube Island near Vienna, in 1465 also the island Mölk, were flooded to the tops of the trees.

(19) Destructive were also the floods of 1490 and 1499, of which the latter destroyed several places in the Tullnerfeld, but furnished the soil with rich fertilizers for the development of an extraordinary fertility.

(20) In regard to the high water of 1500 detailed data are not preserved; they are, however, for the catastrophe of August, 1501, which in magnitude equalled those of 1342 and 1402. All places along the Danube suffered great devastations; houses and barns were torn away, and boats were used on the streets of Vienna. The water stood 14 yards above the usual height. A large number of people lost their lives in the flood.

(21) After 1508, in which year two summer highwaters are reported, followed the period of 1520 to 1527, with annually recurring damages by water, which led to the construction of protective works at Nussdorf for the safety of Vienna.

[The author continues in increasing detail as records become more recent and better preserved, and it is not important to give the full list of floods. Only two or three additional instances will be noted because of their special features.]

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(22) Special mention should be made of the autumn high water of 1787 which, with that of 1730, is regarded in the reports as the greatest of the 18th century and extended over the entire Danube valley, the Inn, the Salzach, the Traun and the Enns. Concerning the catastrophe at Vienna the Vienna "Times" of Nov. 3, 1787 says:

Since Monday, Oct. 29, the Danube has risen so extraordinarily, that it has overflowed its banks and flooded all regions on both sides. The same fate befell also Leopoldstadt and the suburbs lying on that stream, and until Nov. 1 the water increased so that it extended into the interior of the city at the Red Tower. In the meantime every possible care is taken by the public in behalf of the flooded regions to prevent misfortune as much as possible and to provide the inhabitants with all the necessities and conveniences of life.

As is reported from Linz [the paper says at another place] the water of the Danube on Monday overflowed there so that at both water-gates it flowed into the city and one could go out and in only in boats. The Enns and the Traun have likewise risen much. In the Salzburg region the Saliza has overflowed and has flooded in a devastating manner the city of Salzburg—where also the bridges were torn away—as well as the surrounding region; here too the water was higher than in the previous greatest floods.

(23) Of the recorded high waters of the Danube and its tributaries the years 1815, 1819, 1824 and 1829 are to be mentioned as high water years. The metropolis, however, did not become the scene of a catastrophe again until the fateful year 1830, a catastrophe of unparalleled extent, which has never been repeated again in such a devastating manner, thanks to the gigantic walls and the mighty embankments, which have since been erected as a protection for the imperial city.

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(24) The causes of this catastrophe were sought at the time in the rapid melting of a large part of the heavy accumulation of snow in the mountain regions of Upper-Austria, Bavaria, Württemberg and Tyrol; further in the insufficient passages under bridges, etc., but not—as to-day—in deforestation, for a certain Dr. Joseph W. Fischer, in Kornenburg, closes his discussion concerning the high overflowing of the Danube at Vienna, published in the Vienna "Times" of March 20, 1830, as follows:

Although the Danube formerly had more water than now, *because larger forests existed*, yet on account of the more rapid changes in temperature these floods, especially after a winter of continuous cold weather and much snow, will hereafter be repeated with more damage, because the space necessary for carrying the water is reduced by artificial means; for the existing openings

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under the bridges (usually located at shallow places), are for extraordinary occasions not sufficient.

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(25) To conclude from this chronological record of the Danube floods that these catastrophes have increased in number, extent and frequency in modern times would be as absurd as to maintain the opposite. The history of the past tells of floods which were not subordinate to those of the present in any of the above particulars. Two conclusions clearly follow from this retrospect:

(a) The floods of 1897 and 1899 were not abnormal or unusual phenomena in the history of the river.

(b) Regulation works have had absolutely no influence in increasing the heights of floods.

(26) Regulation works have no effect upon the origin of high waters, for these must be regarded as elemental ocurrences, produced by natural causes which man, notwithstanding his dominion over the world, is today unable even to explain, much less to control. That floods are always due to rain catastrophes and these in turn to atmospheric disturbances or eruptions will not be denied. The quantity of rainfall and of melting snow is the sole prerequisite for floods in their origin, although their course and progress may be modified by other conditions. Thus the duration and intensity of the rain, the condition (fullness) of the stream before the flood takes place, the presence of vegetation hindering the movement of the water, a high temperature favoring evaporation, a dry soil preceding the rain; but principally the arrival of the flood waves of the various tributaries with the main stream, whether separately and at sufficient intervals so that each can flow away quietly, or uniting their culminations to swell the onward rush to the utmost, all have their effect upon the progress of floods after the precipitation has taken place. Again, if special localities are considered, the orographic and geologic structure as affecting runoff, the slope and cross-section of the water courses, the narrowing of the channel in gorges, or the widening of the same in open valleys—all have an important bearing upon the development of a flood, as do many other circumstances dependent upon the particular case considered. As a rule, the magnitude of a flood is proportional to the precipitation; yet the foregoing conditions may be such that relatively high precipitation may produce relatively small floods, and the reverse.

The remainder of the author's report is devoted to an exhaustive inquiry into the meteorological conditions accompanying the tremendous rains that caused the floods, and does not have any direct bearing upon the subject here under consideration.

The number of floods cited by the author is about 125. Many of them were accompanied by ice gorges which render close comparison with other floods by means of discharge or gage data rather uncertain. A noteworthy feature of the record is the occurrence of flood years in groups. In nearly the entire period, high flood years were bunched together, showing that precipitation moves in cycles. The same law is very characteristic of our own country, as any one can see by examining rainfall records for the past fifty or sixty years. Just now we are in the midst of a period of high precipitation, and it is this fact, not a change in our forest areas, that is producing the abundant crop of high floods of the past few years.

The broad conclusion to be drawn from M. Lauda's paper is that the changes produced by man in the valley of the Danube, so far as these changes are matters of record, have had no appreciable influence upon the origin or behavior of great floods. He advances the very conclusive argument (Par. 4) which our forestry friends always overlook, or at least never mention, that, however correct the theory as to the retentive effect of the forest bed may be in average conditions, it ceases to apply when the bed has become so saturated that its retentive capacity is exhausted. If the author had also been considering the subject of low water he would doubtless have drawn attention to the other extreme of forest influence, viz.: that in mid-summer when the rate of evaporation is high and showers are few and far between, the forest absorbs practically all of the precipitation, giving it off in evaporation, and thus yields less runoff to the streams than the open country.

These considerations are of the very highest importance. The conventional forest theory touches only the middle ground, leaving the extremes unconsidered. But it is with the extremes alone that we are really concerned. If the floods and low waters are provided for, the middle stages will take care of themselves.

This very common and very material oversight in the forestry argument is well illustrated by an experiment now being used to some extent by lecturers on forestry. The lecturer exhibits a smooth impervious surface that sheds water readily, as representing the cleared land, and on some portion of this he places a piece of blotting paper or other absorbent material to represent the forest bed. He then sprinkles the entire area and the audience readily sees how the water immediately runs off from the hard smooth surface but is largely retained by the absorbent surface. The lecturer coolly assures them that the action of the blotting paper represents the normal effect of the forest bed in restraining the runoff from rainfall. Sometime, I apprehend, a listener of more inquiring mind or more courageous disposition than the rest will interrupt proceedings somewhat after this fashion:

"Mr. Lecturer, will you not carry your illustration to its logical conclusion. Please sprinkle more copiously and continue until that blotting paper is completely saturated so that we may see if the water will not then run off from it as quickly as from the other surface. Then sprinkle in small showers with considerable intervals between them. If the air of the room is warm, as in the hot summer time, that portion which falls on the paper will all, or a large part, be evaporated between the showers and practically none will run away; although a considerable part of that which falls on the smooth surface will run off. If you will add these features to your illustration your audience will see that in times of great rainfall forests cannot diminish floods in the least degree, and in periods of prolonged hot weather they yield to the streams less water than does the open country."

Such an interruption would no doubt be embarrassing to the lecturer, but it would be highly instructive to the audience.

In (5) and (26) the author refers to a feature of prime importance in the behavior of forests. The forest bed may store up a considerable portion of the earlier rains of flood-producing storms, and by yielding up the stored waters later when the crisis of the storm is on, may produce flood combinations that would not have occurred had the earlier rains flowed more promptly into the streams. As in a great freight yard or dispatching point it is important to transmit incoming freight promptly and thus avoid congestion with later traffic, so a great river, other things being equal, will be less liable to become congested, in times of heavy precipitation, if it carries away promptly the runoff from earlier rains instead of delaying and possibly being compelled to carry it away with a greater runoff which may come later.

In (3) the author refers to the effect of forests upon snow melting and here commits a capital error: one, however, which runs through nearly all the literature on the subject and is firmly rooted in the popular mind. Yet it is an error so evident that it will at once be recognized when attention is called to it, and it is inexplicable how it should have survived so long. In my paper above referred to I have discussed this subject in much greater detail than can be done here; but I will at least summarize the leading arguments.

Forests almost invariably concentrate and intensify the runoff from melting snow. This results, first, from the fact that the forests break the wind and prevent the formation of drifts which are very important regulators of runoff from snow and in the mountains are among the most perfect reservoirs known. The forest prevents their formation entirely and spreads the snow in an even blanket over the ground. In the second place, the heavy shade of the forest, evergreen forests particularly, prevents melting under the sun's rays and holds the snow for a greater or smaller length of time, depending upon the latitude, altitude and exposure. This is often cited as an advantage, in giving the water from the snow a chance to sink into the ground. But this result does not ensue. The snow is absorbed in its own mass, until it is reduced to a fourth or fifth of its volume, the ground still remaining comparatively dry. This continues until the genuine warmth of the advancing season has arrived, and the soft air and rains find a maximum surface exposed to the melting influences. The snow turns into water very rapidly, and often causes destructive freshets where the neighboring open country is yielding only an ordinary flow to the streams. The melting, once begun, lasts but a little while, when the forest snows are all gone.

In the open country, on the other hand, the great mass of the snow has been heaped into drifts by the winter winds. Melting begins early in the spring through sun action, the thin areas being attacked first, and the streams rise and fall daily following the action of the sun. No flood or freshet ever comes from this source. By the time the heat of the later season arrives, which makes such quick work of the forest snows, the open-country snows are confined to the large drifts where the volume is great but the exposed area small. These drifts continue for weeks and perhaps months after the forest snows have disappeared. They have equalized the flow and have carried it far into the summer. The forests have concentrated it into a brief period with correspondingly increased intensity. The great value of these drifts is well understood by ranchmen who live near the mountains and who watch their formation during the winter with keen interest.

Then there is an actual loss of moisture through the greatly increased evaporation from snow in the forest (due to its extensive area of exposure both on the ground and over the foliage of the trees at certain times) and through the heavy draft from the soil for maintaining a dense forest growth, naturally diminishes the quantity of water that reaches the streams. While, therefore, it is constantly asserted that our mountain forests are necessary for the supply of water for irrigation, the exact reverse is the case; and the supply would be more copious and more uniform if the forests were not there. This, of course, is not intended as an argument against the forests, for they are so necessary for timber and other economic purposes that their value for these purposes more than offsets the disadvantage to the water supply.*

Of course, this influence is less pronounced in deciduous than in evergreen forests, for in deciduous forests both wind and sun have freer play; but the principle applies proportionately as the conditions prevail, and it will always be found that snow melting in the spring time begins and ends in the open country and is consequently more prolonged and uniform than in the forests.

On the Pacific Coast, where the densest forests in the world exist, with the deepest beds of humus and most perfect retentive action while it lasts, are found some of the most torrential streams in the country. This is due in part to the continuous succession of rains when the rainy season begins, and the resulting saturation of the forest bed; but in large part to the effect of forests upon the snow fall. Heavy falls of snow are distributed evenly over the ground and throughout the branches and foliage of the trees so that the surface exposed is developed like the cells of the lungs and is a thousand fold greater than in the open country. Following these snowfalls there frequently come warm ocean winds and rains which melt the snows with great rapidity, and snow and rain—yesterday's storm and to-day's—go down to the sea together in raging torrents that exhibit a destructive energy scarcely to be seen in any other section of the country.

In (3) the author refers to the protective agency of the forest in preserving the soil on the mountain sides from denudation, thus preventing the destruction of fertile lands and the silting up of rivers. The history of certain regions in Southern France on the slopes of the Maritime Alps, and also in Italy and Austria, where great denudation at one time followed injudicious efforts at clearing and cultivation, have given this matter a degree of importance in Europe which does not find its counterpart in this country. Moreover, the author's bare statement of fact fails to place the responsibility for this denudation where it really belongs. Forest cutting in itself—even forest burning—very rarely results in soil erosion. A soil that will maintain a heavy forest growth will immediately put forth a new growth when the forest trees are cut down, and this new growth will invariably be of a denser, closer character—briars, young trees, and shrubbery of all kinds—than that of the virgin forest itself. Our

*I would invite attention in this connection to an extremely well-written and instructive article in "Science" for April 10, 1896.

second growth woodlands, our slashings, full of tangled undergrowth, are certainly better protected against erosion than the areas of tall, clean timber, and far better than will be the well-groomed forests under scientific supervision. It is only where timber cutting is followed by road-building, extensive grazing, and particularly by clearing and breaking of the soil, that erosion results.

It is not the absence of forest trees but the presence of cultivation in all its forms that leads to erosion. The question of arresting or controlling such erosion, is one of dispensing with or improving cultivation. If these cultivated grounds can better be abandoned and turned into forests, let that be done. If they cannot be—and this, of course, is the case with most of our cultivated lands—then the evil, so far as it exists, cannot be helped by forestry at all but only by better methods of cultivation.

The evil itself has been most absurdly exaggerated in these later days. We are told over and over again that a thousand million tons of soil is carried by our rivers into the sea every year, and that this represents a direct loss to our fertile soils. As a matter of fact, probably not more than one-fifth comes from lands that have ever been cultivated or are likely to be for generations to come. The vast down wash from the Bad Lands and desert regions of the West and from the high mountains, represents by far the greater portion of this soil and every particle so washed down is a benefit to humanity; for it not only reduces inaccessible and useless lands to some approach to accessibility but deposits the eroded material where it can be made some use of. The actual loss to our farming lands on the average is extremely small. It is doubtful if it amounts to a quarter of an inch in a century. It cuts no figure in the condition of our rivers when compared with the vast load that comes from other sources over which man as yet exercises no control.

It is said on the authority of a high government official that this billion tons of soil is worth a billion dollars, which immense sum—almost equalling the cost of running the government for a year—represents the annual loss from soil wash alone. As already stated, probably four-fifths of this quantity represents the transfer of soil from places where it is of no earthly use to places where it is of some use, and in many cases of very great use. This transfer is certainly a benefit and not an injury, except as to the relatively very small percentage that gets into ditches, canals and reservoirs on its way to the sea. Let us estimate the value of these operations of nature at only 25 cts. per ton, and allow the estimated dollar a ton for the portion that comes from agricultural lands. It will appear that, instead of a billion dollars annual loss, nature's account pretty nearly balances itself.

Recently in a public address another official of the government who stands high as an authority on these matters made the following statement:

> We have the most wonderful system of rivers to be found in any civilized country and the least used. There is less transportation on our rivers, taken altogether, now than there was fifty years ago, and in spite of the vast sums spent upon them they are less navigable now than they were then. We have allowed them to be clogged with the soil washed from our fields and mountain sides and have wasted their value for navigation. The fertile soil which has clogged our rivers has been washed from our fields, and every one of the hundreds of millions of tons so lost every year helps to make the farmer poorer and to reduce the product of our farms.

Here, by implication, if not by direct assertion, the low state of navigation upon our inland waterways is charged up to soil wash and this to deforestation, and the natural inference is that the restoration of navigation is dependent upon reforestation. In the first place our inland waterways, at least the principal streams, are not less navigable than they used to be. Their navigable condition is much improved. If the steamboat men of fifty years ago could have had the rivers we have now they would have considered themselves in clover. That our rivers are less navigated than they used to be is perfectly true, and there has never been the least doubt as to the real reason. It is only very recently that a new reason has been suggested. The Missouri River, for example, is in a better navigable condition to-day than it was when boats piled its entire navigable length of 2,285 miles; but no boats run there to-day for the simple reason that they cannot live and carry freight at the same rates at which the railroads carry it. The natural difficulties of navigating that stream are too great. This and similar reasons apply to the Mississippi and Ohio and their tributaries. The railroad comes to the people's doors; it carries them and their produce in the direction they want to go; it carries them 400 miles a day as against 50 to 100 by the river; it operates in winter as well as in summer; in the fall of the year when crops are harvested and freight is most abundant and transportation most needed, the railroad is in the best physical condition of the entire year while the rivers (through low water) are in the poorest; and finally the railroad carries so cheaply that the profit is taken out of the river business. There is no mystery about all this. It is a simple case of the survival of the fittest. The railroad satisfies the needs of the people better than do the rivers and it gets the business. In Europe railroads do not serve the people as well or as cheaply, while far greater attention is given to the development of waterways than here, and this fact and the greater density of population, are the true reasons why the inland waterways of Europe are used more than they are in this country.

But now a new era is dawning in the history of our inland waterways because of the enormous development of the country and the consequent increase of freight traffic. So great has the volume of business become that the railroads are physically unable to handle it. With the utmost practicable expansion, it looks as if they will continue to be unable to handle it. And so we must look to our rivers again. Public sentiment, which a few years ago severely criticised a river and harbor bill that carried $25,000,000 for two years' work, now wants a guaranty of $50,000,000 annually as a regular thing; and we devoutly hope it will come; for it is this, and not anything that may be done through the agencies of forestry and soil-wash control, that will place our waterways in a condition to compete with the railroads.

Perhaps the most remarkable feature of this forestry propaganda is the unquestioning acceptance by the public of theories and statements of fact that are utterly unfounded and untenable. It is certainly a great proof of the deference paid by the public to those in authority and who are supposed to know whereof they speak. Marsh, speaking of the unfounded claim that deforestation reduces precipitation ("The Earth as Modified by Human Action"), criticises this tendency in the following terms: "The scientific reputation of many writers * * * has led the public to suppose that their assertions rested on sufficient proof." There is too great a readiness to do this in our own country at the present time. Let the over-credulous reader who accepts at their face value the perfervid utterances of magazine writers and public lecturers upon these subjects (accepts them because they profess to be based upon data given out by official authority) do a little thinking on his own account. He has seen forests and fields and rivers as well as they whom he trusts so implicitly. Let him verify their theories and assertions by his own observation. Let him consult the records both in this country and Europe and find out how utterly without foundation is the claim that floods or low waters are more frequent or pronounced now than they used to be. If he is still unconvinced and really feels that in spite of the facts there must be some hidden virtue in the forestry argument—that where so much smoke is there must be some fire—let him ask what relief forestry can give, assuming its theory to be true. Can the total forest area of our country be increased? Not by so much as a single acre. Remember that, so far as runoff is concerned, the second growth timber, the woodland generally, as distinguished from the native forest, is just as effective in controlling runoff as the virgin growth and more effective than will be the clean and raked-up forest under culture. Now it will never be possible to increase this woodland area. The requirements of cultivation and occupancy will rather cause it to be reduced. There will doubtless be a shifting of forest areas, but the grand total cannot be increased. Here is an impassable barrier. The remedy, if a real one, cannot be applied. The possible changes in forest acres are so small as to be utterly insignificant in comparison with the whole area affected. As the author well says (8), "We cannot ascribe to an increase or decrease of forest areas by a few hectares * * * any influence upon the origin, frequency or behavior of such catastrophes [floods]."

Marsh, in the celebrated work just quoted from, devotes his main energy to the forestry argument and is the forerunner of the propaganda as it exists to-day; but he is compelled to surrender his entire position so far as it relates to floods, as may be seen in the following quotations: "I am unable to refer to a single instance where the record of the rain gage for a considerable period before or after felling or planting of extensive woods can be appealed to in support of either side of the question" [of precipitation] (p. 192); and "floods will always occur in years of excessive precipitation, whether the surface of the soil be generally cleared or generally wooded" (p. 473). In other words, forests have no influence upon precipitation and are helpless to prevent floods when the requisite precipitation comes. This is the whole case in a nutshell. It is a position that has never been successfully assailed and never can be.

In a letter from M. Lauda, replying to one in which the influence of forests upon melting snow was pointed out, the distinguished engineer assented to the correctness of the views expressed, but added naively, "I should not wish to be quoted as opposed to forests." This, I suspect, is the attitude of many engineers in our own country who understand the utterly unreliable and untenable character of much of the forestry argument. We all believe in forests, appreciate fully the necessity for them, desire to see them developed in every legitimate way and endorse the excellent work being done to this end by both public and private agencies.

Doubtless in most cases the disposition is to let pass without notice assertions that would ordinarily be met with instant challenge and even rebuke, knowing that the movement itself is a good one and believing that the misrepresentations which characterizes its propaganda can do no harm. But they are doing harm, just as the promulgation of error in any form does harm. I do not refer at all to the tendency of these teachings to discredit the work which the government has done and is now doing in the improvement of its inland waterways, but solely to their effects upon the best interests of the waterways and of forests themselves. The public has been led to believe implicitly, as any one can see from the literature of the day, that in forestry may be found a sure relief from the evils of high and low water and obstructed river channels—that through their agency floods will cease to be and that our rivers will flow clear and limpid to the sea, *as they used to* before the forests were cut away! As a matter of fact the forests will have, can have, no more practical influence upon these matters than have the changes of the moon. The false hopes thus being built up must, of course, end in bitter disappointment.

Teaching the public to think that if they will only spend their money in planting forests they will not have to spend it in protecting themselves from floods or in improving their channels for navigation, is a species of false prophecy that cannot be frowned down any too soon. These floods will always come until the order of nature in its atmospheric behavior is radically changed or brought under human control. They can be dealt with successfully only by direct artificial means. There are three principal agencies by which they can be controlled: removing natural or artificial obstructions from the channels, storing flood waters in reservoirs,

and building protection works on the banks. These means are given above in the inverse order of their practical importance. In some cases the gorging effect of obstructions can be removed and thereby secure a degree of local relief. To an increasing extent reservoirs will be used to mitigate floods, but their control can hardly be decisive. *The great means in the future as in the past will be the arbitrary confinement of floods within designated channels by means of levees or other similar works.* [Italics ours.—Ed.] The public should not be led to believe that it can ever evade the cost of these works and it should not be encouraged to defer grappling with these problems wherever they exist in the hope that they will somehow solve themselves indirectly through tree planting, soil-wash prevention or any other similar means.

As it seems to me, the cause of forestry itself must suffer by linking it so closely with a subject with which it really has no practical connection. If it were not for the erroneous assumption that forests have a regulative effect upon our rivers and so are beneficial to navigation and useful in controlling floods, would we think of selecting the rugged and inaccessible mountains as the home of our future forests? In the western mountains this is, of course, to a great degree necessary, because forests will not grow anywhere else; but it is not so in the east, where the bulk of the population dwells and where forests grow anywhere. The increased cost to the people of timber procured in the mountains is relatively very great. A recent editorial expression in Engineering News pointed out this fact very effectively in these words: "The cutting off of the forests on the remote mountain slopes has only become possible with the high price of lumber that has prevailed for ten years past." This is the tax, amounting to 25 to 100%, which must always be paid for lumber from these sections. If the people are to give their good money to build up national forests would it not be far better to locate them in the lowlands, convenient to transportation, convenient for access and enjoyment by the people, than to locate them in the mountains? There is scarcely a county east of the meridian of Omaha that would not sustain such a forest. In most sections there are tracts ill-suited to agricultural operations and better adapted to forest culture than to anything else. Local communities would feel a more direct interest in such forests, for their benefits, both in timber and in the enjoyment of access, would come more directly home to them. Undoubtedly states, counties or other local agencies would willingly contribute to the first cost of these forest lands, and even if the government's share in such cost were several times what similar areas would cost in the mountains, they would be cheap in comparison, for they would in a few years return by their greater benefits the difference in original outlay. These forests are presumably to be maintained indefinitely, and the first and most important consideration in their location is to see that it will satisfy most completely the purpose for which they are to be established.

Whatever the present propaganda may claim, the primary and the only basis for these forests that will justify their creation and maintenance at public expense is the *timber* which they are to supply. I apprehend that very few have stopped to consider, in this campaign for an Appalachian reserve, that it is proposed to select for this enormous purchase (running up probably to ten million dollars) the poorest and least available lands for this purpose that can be found between the Atlantic and the Mississippi. The very fact that the native timber on these lands has remained uncut until it is gone elsewhere and until the price of timber has doubled and trebled over what it was not many years ago when the supply came from the lowlands, is sufficient proof of this statement. How much better it would be to take this ten million dollars, invite local communities to add as much more, and commence the building up of forests in carefully considered locations all over the country!

But the influence upon stream-flow, some one will say, makes it necessary to maintain the forests on the mountains whence comes most of the water supply for our rivers. I have endeavored to show on how slender a basis this argument rests, but admitting its validity for a moment, it is still an indubitable fact that the same forest bed will exert a greater retentive effect in a comparatively level country than on one of steep slopes. If any one doubts this, let him take the standard illustration of the forestry service—the smooth, hard surface and the absorbent material, even the blotting paper which is as unreasonable a parallel as could be thought of on account of the total dissimilarity of texture—and tilt these surfaces up to a highly inclined position and he will quickly learn how much less water any absorbent material in the shape of a thin covering will retain than when lying nearly horizontal. But, there is so much more rainfall in the mountains! Yes, but will a pan hold more than its capacity simply because more water is poured into it? And will it hold as much tipped up sidewise as when standing level? And will it not hold less the more it is tipped up? But the question of erosion? In that respect the mountains will take care of themselves wherever they are not reduced to cultivation, and in such places it is a question for the agriculturalist. In a country of such abounding vigor of vegetable growth as is the whole region of these mountains it is impossible to make the soil barren by the simple cutting of timber. If the whole Appalachian forests were burned off to-day, within a year they would be replaced by a rising growth that would protect the drainage areas just as well.

No! the forestry argument, as applied to these mountains, will not "hold water," whether it is a question of regulating stream flow in our rivers, preventing soil erosion, or providing a timber supply for future generations.

Like M. Louda, I would not wish that the views above expressed should be construed as antagonistic to the true interests of forestry. No one, it seems to me, can fail to appreciate the importance of this cause nor wish to restrict its expansion in any legitimate direction. In particular I would yield to no one in admiration of the remarkable work which the present chief of the government forest service has done and is doing—a work which affords another example of the historic fact that every great movement sooner or later brings into its service the individual best qualified to carry it to success. But while this is true, it is also true that the forestry argument is being carried into fields with which it has no legitimate connection, and to the detriment of its own and the invaded territory alike. An example of this may be seen in the following claims for the beneficial effects of forests as quoted from "Forestry and Irrigation," April, 1907.

> The great flood [January, 1907] which has wrought devastation and ruin in the Upper Ohio Valley is due fundamentally to the cutting away of the forests on the watersheds of the Allegheny and Monongahela rivers. * * * The ruin of the mountains is accomplishing the ruin of the valleys. * * * Disease will come later when its fruitful germs have multiplied on every foot of the inundated valley. The value of the property destroyed in this one flood is probably sufficient to buy enough land at the headwaters of these streams to fully protect them.

Now it is absolutely impossible to establish by any proof worthy of the name a single count in this indictment, if it may be so called. Theory and records are alike wholly against the possibility that forests, no matter how extensive, could have moderated the intensity of that flood at all. It would be easier to prove that they would have aggravated it. The direct inference from such assertions is that the planting of forests on these drainage areas will prevent similar disasters in the future and the suggestion is directly made that public money for flood control should be expended in this way. Let us suppose that the city of Pittsburg should raise ten million dollars and turn it over to Mr. Pinchot with *carte blanche* as to its use subject only to the condition that it should secure the greatest measure of relief the money is capable of securing. Accepting this responsibility, and realizing his obligation to accomplish a specific purpose, would he dare to expend it in reforesting the drainage area to the omission of works of flood protection in the city itself or in the building of reservoirs? And would he be willing to guarantee to the city of Pittsburg that the cost of these purely artificial measures could be reduced in the least degree by anything that he might do on the drainage areas in the line of tree planting? I do not think he would.

Of course I do not question for a moment that Mr. Pinchot and his associates implicitly believe in the theories which they are so earnestly promulgating; but it is a belief born of zeal in a cause which is very dear to them rather than from a clear understanding of the principles of stream flow involved. The education of the public in these erroneous theories is regrettable from the standpoint of stream flow and forestry alike. On the one hand, it creates expectations that must end in disappointment and tends to postpone measures which alone can accomplish desired results. On the other hand, it locates the sources of a large portion of our future timber supply where they will not serve the public to best advantage.

ADDENDA.

In the foregoing criticism, as well as in the American Society paper, the flood side of the forestry problem is given more attention than the drought side, because it has been until quite recently more prominently before the public. In the last-mentioned paper, however, the following reference to it was made:

> Rarely does one stop to think how far better it is for the country to have these wet periods, even with all their floods, than the dry periods that will surely follow. A single dry year may cause more loss to the country . . . than the floods of an entire cycle of wet years.

Scarcely was the ink dry upon this statement when fresh proof of its correctness was at hand. For upward of two months (writing Oct. 1, 1908), throughout a large portion of the northern and eastern section of the country, there has been practically no rain, and the resulting distress and loss has been very great.

It requires no gift of prophecy to foretell that this circumstance will be immediately seized upon in certain quarters as an added proof of the evils of deforestation; and as this feature of the forestry propaganda may have considerable prominence in the immediate future, it is desirable to give it at least a passing reference.

First, as to the cause itself of the drought—lack of precipitation—there is nothing whatever in rain gage records in this country or in Europe to show that a greater forest area would have increased precipitation a particle. The primary cause of the drought thus remaining the same, how would an increase of forest areas have affected the interests of various kinds which suffered from the drought? The principal of these interests are stream flow and agriculture. I have indicated in both my papers upon this subject the reasons for believing that forests diminish the flow of the larger streams more than does the open country in periods of prolonged drought. If there are occasional showers, the yield to the streams is undoubtedly greater in the open country than in the forests where practically all of such showers is absorbed and lost in evaporation. In regard to agriculture, it is impossible to believe that any practicable increase of forest areas in the region affected would have helped matters at all. It would not have increased the rainfall or the dew, nor even the supply from the ground itself; for the forest soil, as is now well recognized, is dryer, except at the immediate surface, than that of the open country. In short, from whatever point of view considered, it is evident that the calamity of a great drought cannot be modified in the least degree by anything that can be done in the domain of forestry.

"But are we helpless then?" it may be asked. "Is there no possible relief?" Let us be honest with ourselves in answering these questions, and not, ostrich like, hide our heads in the sands of some popular delusion, blindly hoping that our old enemy will not see our bodies, although these are just as much exposed as ever. There is *some* relief of a definite and positive character. So far as stream flow is concerned, these excessive shortages can be largely overcome by storage reservoirs. It does not take much water, relatively, to keep up a generous *low water* flow in most streams. Canals, mills, domestic supply,

and all other interests dependent upon the direct use of running water can be greatly aided in this way. On the farm itself there will gradually be introduced, even in the eastern sections of the country, means of irrigating those crops that are most dependent upon a continuous supply of water; but it can hardly be expected that this resource will reach the great body of agricultural land. As to other relief, no one can honestly hold out any substantial hope; unless he can present some plan for producing rainfall.

One other fact in regard to forests should be referred to, and that is that, in times of drought, they are the greatest menace to life and property in existence. Dried out by two months' lack of rain, a large forest is a tinder-box—a veritable death-trap to population located within or near it. A forest fire when driven by wind (and a great conflagration develops its own wind) is as nearly uncontrollable as any of the elemental forces of nature. Houses, villages and human lives by the hundred have been swept away by them. While such fires are practically irresistible, no matter what the topography, their intensity is increased on steep mountain slopes, particularly on south and west exposures; for such slopes dry out more completely under the sun and they increase the force of the winds (prevailing winds are southwest) sweeping up against them. The most unfavorable place for fighting a forest fire is on a steep mountain side with the fire ascending the slope.

This is another illustration of the importance of scattering forests throughout the lowlands in relatively small and compact bodies, instead of massing them in the mountains. Forest fires can be more surely prevented in that way, and such as do break out can be more easily controlled. Forest culture, combined with proper patrol work, will accomplish a great deal, and the evil of these conflagrations ought gradually to be overcome.

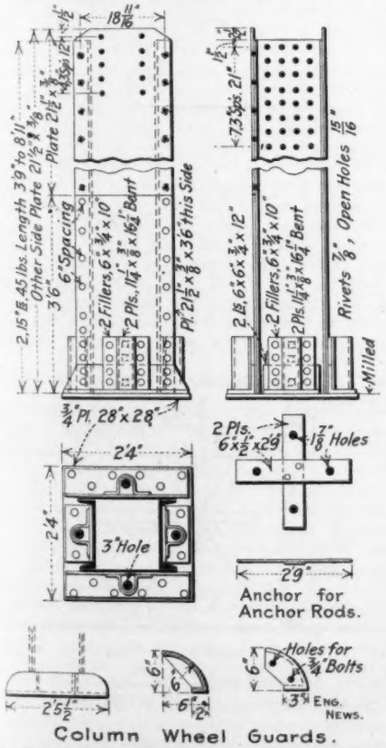

Fig. 2. New Column Bases for Lengthening the Columns of the Elevated Railway.

RAISING THE CHICAGO & OAK PARK ELEVATED RY.; CHICAGO.

The raising of an elevated structure above its original level is a class of work which has been required at different points of the elevated railway system of Chicago, owing as a rule to the elevation of the tracks of steam railways which pass beneath them and which were originally built at the street level. Such work involves peculiar difficulties in view of the necessity of avoiding interference with traffic upon the structure and in the streets beneath it.

The latest piece of work of this kind has been made necessary in order to allow the Chicago & Northwestern Ry. to build the four-track elevated approach to its new terminal station. This line will cross Lake St., which is occupied by the Chicago & Oak Park Elevated Ry. (formerly known as the Lake St. Elevated Ry.). The latter line has been raised therefore to give the necessary clearance for railway trains. The maximum raise was about 6 ft. This part of the line was originally at a considerable height, owing to grade conditions, and at the highest point the new tracks are now nearly 40 ft. above the street. The general arrangement is shown by the plan and profile, Fig. 1.

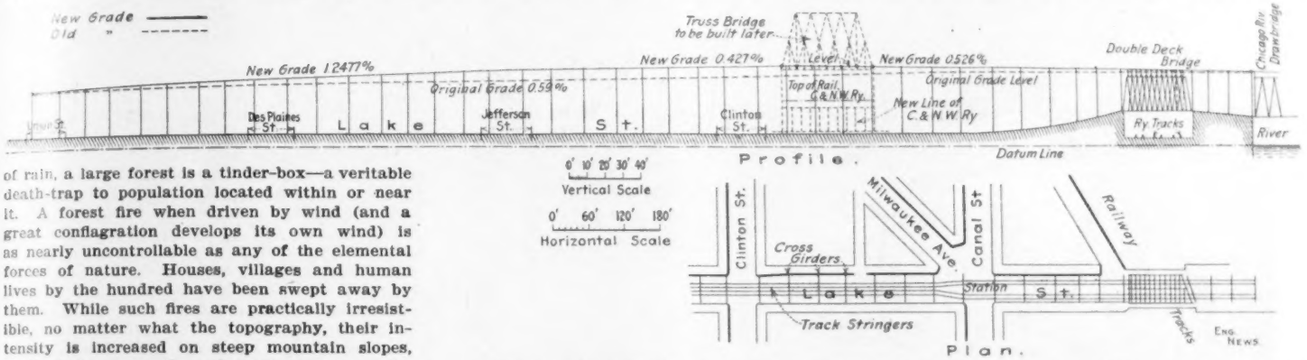

FIG. 1. PLAN AND PROFILE OF THE CHANGE OF GRADE ON THE CHICAGO & OAK PARK ELEVATED RY., CHICAGO.

The change of grade extends from the west end of the Chicago River drawbridge to Union St., a distance of about 2,100 ft. It includes a bridge over railway tracks just west of the drawbridge. The line was originally level as far as Milwaukee Ave. and then descended by a grade of 0.59% to Union St., where the rails reach their normal elevation of about 25 ft. above the street. As now altered, there is an ascending grade of 0.526% from the river to the crossing of the Chicago & Northwestern Ry., beyond which there are descending grades of 0.427% and 1.247% to the original elevation at Union St.

The structure of the elevated railway consists of columns at the curb lines of the street, supporting transverse plate girders. Between these girders are four lines of plate-girder track stringers on which the track ties are laid. This arrangement is shown by the plan in Fig. 1. The cross girders are of 45-ft. span, and the longitudinal girders vary from about 30 to 50 ft. Each column is composed of two 15-in. 33-lb. channels, set with the flanges inward and having 4 × 7/16-in. lacing bars riveted to the flanges with ¾-in. rivets. The channels are 14 ins. back to back, and their webs are parallel with the track. The outer channel is carried up to the top of the cross girder and riveted to the end of that girder. There are small knee-brace connections. Each brace consists of a flat plate having its ends bent so as to be riveted to the inner face of the column and the bottom of the girder. The plate is stiffened by a tee bar riveted upon its upper side. The columns are seated in cast-iron shoes having sockets shaped to fit the channels, lead being run in to make a tight joint. These bases are anchored to concrete pedestals.

When the structure was raised (in the manner described below), the column shoes were removed, and the ends of the old columns riveted to base sections of proper length. These new portions (Fig. 2) are box columns having two 15-in. 45-lb. channels (with the flanges outward), and two side plates ⅜ × 21½ ins. riveted over the flanges. The backs of the channels fit against the backs of those of the old columns. The plates and channels are drilled for ⅞-in. rivets, and when the new portion is in place, it serves as a template for drilling the old columns. The new work is of open-hearth steel, made to the "Manufacturers Standard" specifications.

No cast-iron shoe is used, but the new column has a flat base plate. On each side, at the bottom, is a sleeve for a 1¾-in. anchor bolt. These bolts are 8½ ft. long, threaded at both ends. The lower ends pass through anchor plates and have square nuts below these. The upper ends pass through the sleeves on the column and have hexagonal nuts bearing on ¾-in. washer plates 4 × 4¾ ins. At the street level the column is surrounded by a cast-iron wheel guard, as shown. There were about 125 tons of steel work used for the new columns and knee braces, and about 20 tons of cast-iron for the wheel guards and the pedestals on the bridge noted below.

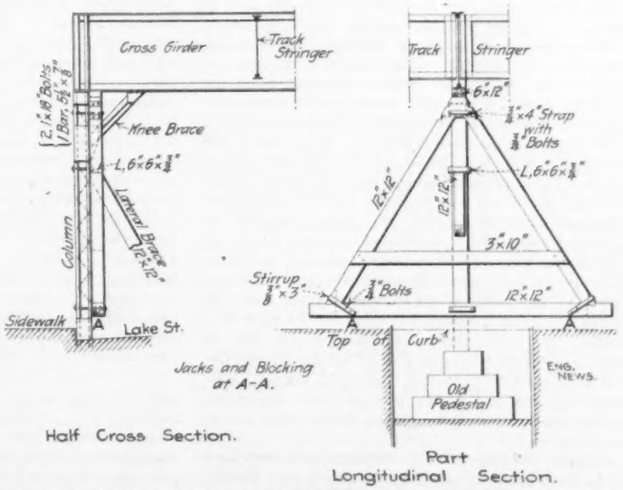

FIG. 3. DETAILS OF A-FRAMES USED IN RAISING THE ELEVATED RAILWAY.

Before raising the structure it was necessary to give a more rigid connection between the columns and cross girders than that afforded by

the column attachment and the old knee braces. Latticed braces were applied therefore (below the old braces), one end having a saddle riveted to the bottom of the girder and the other end having large connection plates riveted to the side flanges of the column.

The structure was lifted by pressure applied under the cross girders. Just inside of each column was placed a timber A-frame, the apex bearing against the bottom of the cross girder, and the horizontal base timber or sill resting at each end on a pile of blocking. The construction of the A-frames is shown in Fig. 3. A part of the work in progress is shown in Fig. 4, with the men at work on the jacks of one pair of A-frames. This view shows also the character of the structure, and the old and new knee braces. It will be noted that the cross girders are drilled for the attachments for four additional lines of track stringers. This is to provide for a future four-tracking of the road, and was done at the time the girders were manufactured. The large covered wagon near the A-frame on the left side of the view is the superintendent's portable office, with telephone equipment. Beyond this is one of the portable electric air-compressor plants for serving the drills and other pneumatic tools. It will be noted, also, that there is comparatively little obstruction of the street by the blocking.

FIG. 4. RAISING THE CHICAGO & OAK PARK ELEVATED RY. ON LAKE ST., CHICAGO.

(The men are working simultaneously on the jacks under the two A-frames supporting the first cross girder. This girder has both the old and new knee-braces in place. Beyond the A-frame on the left is the wagon forming a portable office, with telephone equipment. Next to it is one of the portable air-compressor plants. The working platform on the second cross girder is supported by rigid steel hangers, instead of by ropes, thus giving a steadier platform.

In a few cases the A-frames would have obstructed a diagonal street intersection or the entrance to a fire-engine station. In these cases, vertical posts were used, being placed against the columns and supported on short lengths of I-beams carried by blocking. At one point (at the intersection of Milwaukee Ave.), it was impossible to use even this small amount of blocking at the column. The timber post was set therefore at a distance of several feet and was capped by a cantilever of I-beams, the end of the cantilever carrying the cross girder of the elevated railway. At the Canal St. station, special supports had to be provided for the stairways and for the foot-bridges which pass under the structure.

Lateral bracing for the columns was provided by inclined timbers having the upper end butted against a shoe consisting of a steel angle bolted temporarily to the face of the column, while the lower end was seated on blocking. These were made rigid by jacks or wedges between the strut and the blocking. This is shown in Fig. 3. End bracing of a similar character was used also for the river side of the first cross girder beyond the drawbridge. Here the trains come down grade to the bridge and are likely to have the brakes applied, thus exerting a longitudinal thrust upon the structure. These inclined longitudinal struts were set up tight by means of jacks.

When the structure was supported by the A-frames, the anchor bolts of the columns were released, and by means of screw jacks under the sills of the A-frames the structure was raised to the desired elevation. This work is shown in Fig. 4. The height of raise in each case was chalked upon the column for the information of the foreman. Wedges were driven laterally from each side as the jacks were turned, so that the latter were never relied upon to carry the load. When any bent had to be raised any large amount (as for an additional course of 12-in. blocking), a man was stationed above to signal when the track was clear. Shims and small blocks were filled in as the work rose, until the 12-in. blocks could be placed. When the full elevation had been attained, the jacks were removed.

The old cast-iron shoes were then taken from the columns. An excavation was made around the pedestal, the concrete demolished, and supplementary blocking fitted under the suspended column to relieve the strain upon its top connections. The new column sections were then adjusted in place and riveted to the old columns. New concrete pedestals were built in the pits to the required elevation, with anchor bolts in the necessary positions. When the concrete had set, the columns were lowered slightly to land them on the pedestals, and the nuts were screwed on the anchor bolts. The cast-iron wheel guards (made in two pieces) were then set in place and grouted with cement.

The drilling, reaming, and riveting were done mainly with pneumatic tools. Electric drills were also used. Compressed air was supplied by two portable outfits, each consisting of a motor, compressor and receiver mounted on a hand truck. One of these is shown in Fig. 4. Electric current for the motors and drills was obtained from the railway system by means of flexible cord conductors. At the station, extensive repairs had to be made, as the lateral bracing and other details had become badly rusted. The working platforms required for this and all other overhead work (including the erection of the new knee braces) were supported by L-shaped steel hangers. The top of the vertical (and longer) leg was formed with an eye which fitted a bar laid across the top chord of the girder. This arrangement, which is shown in Fig. 4, gives a much more steady platform than if the planks had been suspended by ropes, and the men were able thus to work to better advantage.

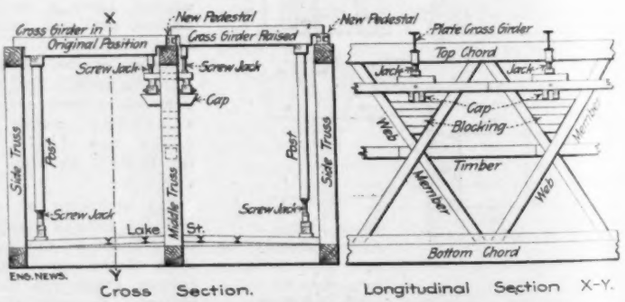

FIG. 5. DIAGRAM SHOWING ARRANGEMENT OF BLOCKING AND JACKS FOR RAISING THE UPPER DECK FLOOR GIRDERS OF THE BRIDGE ON LAKE ST.

At the point where the new four-track line of the Chicago & Northwestern Ry. will pass under the elevated railway (near Clinton St., Fig 1), five of the present spans will be removed, and replaced with two short girder spans and a through truss bridge of 155 ft. span over the railway. The abutment bents for this bridge will have three columns each; one on each track line, and one in the middle of the street. It would be impossible to use a pile driver here without blocking traffic, and it was decided, therefore, to build six foundation piers in steel caissons sunk by the pneumatic system. These will be 10 ft. diameter, and sunk to rock or hardpan at a depth of about 94 ft.

Special methods were required for raising the track on top of the bridge carrying Lake St. over the railway tracks east of Canal St. (and mentioned above). This is a three-truss double-deck bridge carrying the street on the lower deck and the elevated railway on the upper deck. The track stringers of the elevated structure are carried by cross girders which rest on the top chords of the trusses. These girders were raised to bring the track to the new grade, and their ends are now supported by cast-iron pedestals seated on the chords.

The work of raising this upper deck was complicated by the fact that the cross girders were not continuous, but were separate for each track. They had to be raised therefore by jacks at the middle truss as well as at the side trusses. The general arrangement is shown in Fig. 5. At the side trusses, vertical posts were placed under the girders and close against the trusses. These were seated on longitudinal blocking on the floor, and had a screw jack under each post. The street railway tracks, however, are laid close to the middle truss, so that there was no room to set posts between the cars and the truss. As the truss is of the lattice type, the triangular upper panels were filled solid with blocking which carried transverse caps at such a height as to clear the roofs of the cars. These caps were just long enough to carry a line of stringers on each side of the truss, the stringers being bolted together. Upon the stringers was placed blocking, with a screw jack seated under each cross girder. The entire floor was raised simultaneously. Fig. 6 is a view of the bridge, showing the blocking along the middle truss. In the bottom panels of the truss may be seen the cast-iron pedestals which were set upon the top chord, when the cross girders had been raised. At the right is one of the new column bases.

The work was carried on continuously by three eight-hour shifts, and during the main part about 200 men were employed in each shift. The men were paid by the day, so that the force could be increased or reduced flexibly as the work required. No trains were stopped, and there was no interference with traffic of the elevated railway or in the street.

The contract for all this work (including the foundation piers for the new bridge) was awarded to George W. Jackson, Incorporated, of Chicago. The new steel members were built at the shops of this firm. Work was commenced on July 5. It was completed (with all construction material cleared away) by Sept. 15. Mr. I. J. Crowley was General Superintendent in direct charge of the work for the contractors. He had an office in a special wagon (Fig. 4) which was equipped with telephone apparatus and stationed in one of the side streets. This gave ready communication at all times between the superintendent on the work and the shops and offices of the engineers and contractors.

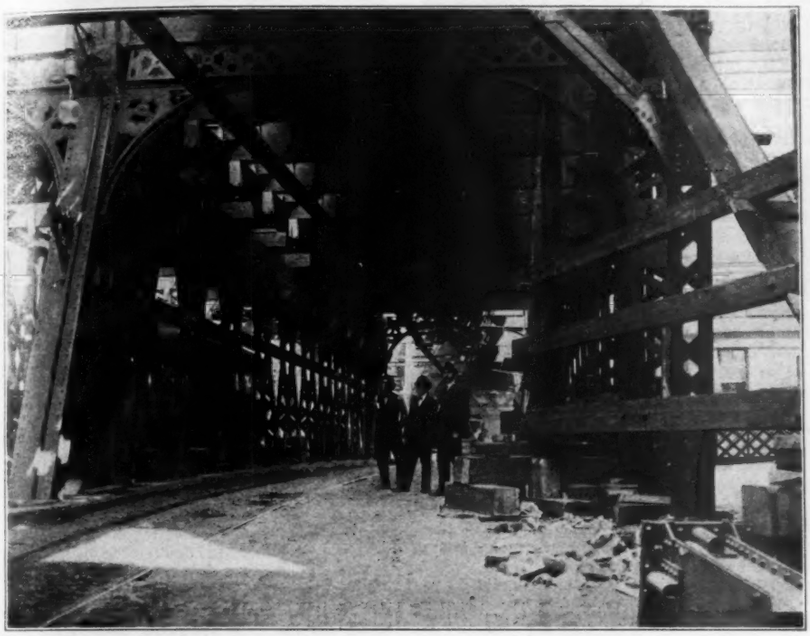

FIG. 6. BRIDGE CARRYING LAKE ST. AND ELEVATED RAILWAY OVER RAILWAY TRACKS; SHOWING THE ARRANGEMENT OF BLOCKING AND JACKS AT THE MIDDLE TRUSS FOR RAISING THE CROSS GIRDERS OF THE UPPER DECK.

The work was done at the expense of the Chicago & Northwestern Ry., whose engineers designed the new steel construction. The plans had the joint approval of Mr. E. C. Carter, Chief Engineer, and Mr. W. C. Armstrong, Terminal Engineer, of this road; and Mr. C. M. Mock, Chief Engineer of the Chicago & Oak Park Elevated Ry.

THE PREVENTION OF ACCIDENTS IN MINES.

The United States Geological Survey has published the report submitted by three foreign engineers, Victor Watteyne, inspector-general of mines, Belgium; Carl Meissner, councilor for mines, Germany, and Arthur Desborough, H. M. inspector of explosives, England, who have been in the United States for six weeks at the invitation of the United States Government to assist the Federal authorities in beginning the investigations authorized at the last session of Congress. The report consists of a series of recommendations with an explanatory introduction. In this latter part, it is stated that the recommendations are the result of examining the American coal-mining industry in the light of their experience in their own respective countries. Typical mines in the more important fields have been visited and conferences have been held with operators, miners and state inspectors. It is stated that the great differences between American and European mining conditions have been taken into account and that although the rapid development of the industry has prevented thorough organization, although the men are largely unfamiliar with mining methods and even with the English language, and although the price of coal at the mine is less than half that in Europe, nevertheless it is believed that the recommendations should be found useful in developing American practice along safe and efficient lines. The report further reads:

Our investigations and recommendations relate primarily to questions of safety in mining; but in this connection we have been greatly impressed with another closely associated phase of the industry, the large and permanent loss of coal in mining operations in many portions of the United States. This is a serious, permanent, and national loss. It seems to be a natural outcome of the ease with which coal has been mined in the United States and the enormously rapid growth of the industry. Certainly much of this loss can be prevented through the introduction of more efficient mining methods.

To be effective, investigations for the benefit of mining must be continuous. The opening up of new mines, the deepening of old mines, the meeting with new conditions, the changing of explosives, and the inauguration of new processes and methods will call for continuous investigations, to be followed by continuous educational work.

The cordial reception everywhere accorded us leads us to believe that these recommendations will be received by the operators and miners in the same spirit of good will as that in which they have been prepared. But the success of this movement for greater safety and efficiency will depend upon the hearty and patient cooperation of the operators and the miners, working together for the accomplishment of this purpose.

The recommendations of the three experts are given intact in what follows:

A.—SELECTING THE EXPLOSIVES TO BE USED.

(1) We recommend that the Government of the United States examine the explosives now and hereafter used in mining, with a view to eliminating the more dangerous explosives and to improving and standardizing such explosives as may be considered most suitable for such use, these to be designated by the Government "permissible explosives."

The term "permissible explosives" is suggested for the reason that no explosives are entirely safe, and all of them develop flame when ignited; and we advise therefore against the use in the United States of the terms "safety explosives" or "flameless explosives," as these terms may be misunderstood and this misunderstanding may endanger life.

(2) We recommend that the operators and miners of coal use only such explosives as are included in a list of "permissible explosives," when the same has been published by the Government, in all mines where there is risk of igniting either dust or gas, selecting that one which their own experience indicates can be used to the best advantage under local conditions.

(3) We also recommend that investigations be conducted to determine the amount of charge of such "permissible explosives" which may be used to the best advantage under different conditions with a view to reducing danger to the minimum.

B.—CARRYING THE EXPLOSIVES INTO THE MINES.

(1) All explosives should be made into cartridges and placed in closed receptacles before being carried into the mine, and the quantity carried into the mine during one day by any miner should be limited as nearly as practicable to the quantity needed by him for use during that day. Handling loose explosives and making them into cartridges by an open light in the mine should be prevented.

(2) Detonators or caps should be handled with great care, and should be carried only by a limited number of responsible persons.

C.—USE OF EXPLOSIVES IN THE MINE.

(1) Shooting in or off the solid should not be practiced.

(2) The depth of the shot hole should be less by at least 6 ins., than the depth of the cutting or mining. The use of very deep shot holes should be avoided as unnecessarily dangerous.

(3) The overcharging of shots (the use of a larger charge than is required to do the work satisfactorily) should also be avoided as unnecessary and dangerous. The proper standardization of explosives used in coal mining will greatly facilitate the carrying out of this recommendation. (See also "A," 1.)

(4) Shots should never be tamped with fine coal or material containing coal. Clay or other suitable material should be supplied and used for this purpose.

(5) The firing of two or more shots in one working place, except simultaneously by electricity, should not be allowed until a sufficient interval has elapsed between the firings to permit an examination of the working place, in order to see whether any cause of danger has arisen.

(6) Before a shot is fired the fine coal should be removed from the working place, as far as practicable, and the coal dust on the floor, sides, and roof, for a distance of at least 20 yds. from the place where the shot is to be fired, should be thoroughly wet, unless it has been demonstrated that the dust in the mine is not inflammable. (See also "E," 1.)

(7) If gas is known to occur in the mine, no shot should be fired until, in addition to the watering, an examination made immediately preceding the time for firing, by a competent person, using a lamp which will easily detect 2% of gas, has shown the absence of that amount of gas from all spaces within 20 yds. of the point where the shot is to be fired.

(8) Believing that such will be one of the greatest advances which can be made in safeguarding the lives of the miners, we recommend the adoption of a system of electric shot firing, in all mines where practicable, by which all shots in the mine, or in each ventilation district of the mine, may be fired simultaneously, at a time when all miners and other employees are out of the mine.

D.—KEEPING THE MINE ROADWAYS CLEAN.

(1) The roadways of the mines should be kept as free as possible from loose coal which may be ground into dust and of rubbish in which such dust may accumulate, in order to facilitate the removal and wetting of the dust.

E.—WETTING THE COAL DUST.

(1) In all coal mines where explosives are used it is desirable, and in all mines containing gas it is highly important, that the dust on the walls, timbers, and floors of the working places and roadways should be kept continually wet prior to and during the work in the mine. If, however, conditions of roof or lack of water render this general watering impracticable, at least the dust within 20 yds. of each shot should be wet before each firing, and other precautions against explosions should be practiced with unusual care.

It is our opinion that a system of watering which occasionally sprinkles the floor only and leaves dry the dust on the walls and timbers of the roadways is useless and is also dangerous in that it may generate an unwarranted feeling of security against an explosion.

F.—SPECIAL PRECAUTIONS FOR MINES CONTAINING GAS.

(1) In any mine where as much as 2% of gas can be detected by suitable method only locked safety lamps of an approved type should be used so long as such condition exists or is likely to recur.

All safety lamps should be maintained in good condition, cleaned, filled, kept in a special room at the surface, and carefully examined both when delivered to the miner and when returned by him at the close of each day's work. A defective safety lamp is especially dangerous because of the false feeling of security it engenders.

In the filling of lamps with benzine or other low-flash oils, which should always be done at the surface, special precautions against fire or explosions should be taken.

G.—USE OF ELECTRICITY.

(1) Electricity in mining operations offers so many advantages, and has been so generally adopted, that no reasonable objection can be made to its use under proper restrictions. The electrical equipment, however, should be installed, maintained, and operated with great care and so safeguarded as to minimize danger from fire or shock. The fact that the effectiveness of some insulating materials is soon destroyed in most mines should not be lost sight of.

We recommend the following precautions: For distribution underground the voltage should not exceed 650

direct current or 500 alternating current; these voltages being intended for transmission to machinery operating at 500 volts direct current and 440 volts alternating current, respectively. Even lower voltages are preferable. The trolley wires should be installed in such a manner as to render shocks least likely; that is, placed either high enough to be beyond easy reach or at one side of the track and properly protected.

Where current at a potential of more than 650 volts is employed for transmission underground, it should be transmitted by means of a completely insulated cable; and where a lead or armored covering is used, such covering should be grounded.

In all mines having electric installation special precautions should be taken against the setting on fire of coal or timber. Inclosed fuses or cutouts are recommended, and each branch heading should be so arranged that the current may be cut off when necessary.

No live electric wire should be permitted in that part of any mine in which gas is found to the amount of 2%.

In all mines producing gas in dangerous quantities, as indicated by a safety lamp which will detect 2% of gas, the working places should be examined for gas by a qualified man, using such a lamp, immediately before any electric machine is taken or operated there.

H.—PRECAUTIONS AGAINST MISCELLANEOUS ACCIDENTS.

(1) In all new construction, shaft lining and superstructures about the entrance of the shaft (or slopes or drifts) should be built as far as practicable of noncombustible materials.

About the entrances to mines every possible precaution should be taken to prevent fires or the injury of the equipment for ventilation and haulage. Ventilating fans should be placed at one side of the mine opening, and hinged doors or light timbering should render easy the escape of the explosive force in direct line of the shaft or slope.

Proper precautions should be taken for immediately preventing the entrance into the mine of heat and gases and for facilitating the escape of the men in case of surface of shaft fires.

(2) The surface equipment for handling the coal should be so arranged as to prevent coal dust from entering the mine shaft.

(3) In all new mines, and in all old mines as far as practicable, suitable man roads should be provided for the men separate from the main haulage roads.

(4) In connection with the system of ventilation it is recommended that in the more frequented roads connecting the intake with the return air courses, two doors be provided, these doors to be placed at such a distance apart that while one is open the other is closed.

(5) In view of the large number of accidents from falls of coal or roof, under the existing practice with shingle props, more attention should be given to the introduction in mines where the roof is bad of better systems of timbering, such as have been long in use with economy and safety in many well managed mines.

(6) In undercutting coal by hand, the premature fall of the coal should be prevented by sprags or other suitable supports.

(7) We believe that the difficulties and dangers encountered in the working of coal seams which are thick and steeply pitching, or of which the coal is highly inflammable in character or subject to firing from spontaneous combustion, and in mines where the subsidence of the surface must be avoided, may be successfully and economically overcome in many cases through the adoption of the flushing system of mining—that is, the filling with sand or other similar materials of the space from which the coal is removed. This system originated in the United States and is now successfully practiced in portions of Germany, Austria, Belgium and France.

I.—MINE SUPERVISION AND INSPECTION.

(1) We can not too strongly emphasize the fact that thorough discipline about the mine is absolutely essential to safety, and that thorough discipline can be brought about only through the hearty cooperation of the operators, the miners and the State.

(2) We are of the opinion that the responsibility for safety in the mine should primarily rest with some person, such as the manager or superintendent, clothed with full authority; and that such person can greatly facilitate the attainment of safety through the employment of a sufficient number of foremen, and also of one or more inspectors whose special duty it shall be to see that the regulations are strictly enforced.

(3) The State can not exercise too much care concerning the experience, technical training, and selection of its inspectors. Their positions should be made independent of all considerations other than that of efficiency; and their continuance in the service should be coexistent with good behavior and proper discharge of official duty.

J.—TRAINING FOR MINE FOREMEN, INSPECTORS, ETC.

We are of the opinion that the cause of both safety and efficiency in coal mining in the United States would be greatly aided through the establishment and maintenance in the different coal regions of special schools for the training of fire bosses, mine foremen, superintendents, and inspectors. The instruction in such schools should be practical rather than theoretical.

The work of these schools would supplement most effectively that of the colleges already established in many parts of the country for the more thorough training of mining engineers.

ANNUAL MEETING OF THE ASSOCIATION OF RAILWAY SUPERINTENDENTS OF BRIDGES AND BUILDINGS.

The 18th annual convention of the Association of Railway Superintendents of Bridges and Buildings was held at the Arlington Hotel, Washington, D. C., Oct. 20-22, 1908. About 100 members and as many guests were in attendance. The usual delightful Washington autumn weather prevailed throughout the meeting, so that the entertainment features, which consisted mainly of excursions to nearby resorts of historical interest and in local sightseeing, were especially enjoyable. There was also in the parlors of the hotel a small exhibition by the supply men of various waterproofing, fireproofing, painting and other construction details which were of interest to members of the Association.

One of the principal acts of this annual convention was the adoption of a new constitution, which while changing several unimportant details of administration, made the very important change of the name of the society to the American Railway Bridge & Building Association. This was done because at present there is no uniformity in the title of the railway official who does the work of the superintendent of bridges and buildings so that the original name seemed a misnomer. Along with the revised title the qualifications for membership were also slightly changed so that they now read:

A person who is actively engaged in railway service in a responsible position in charge of work connected with the construction or maintenance of railway bridges and buildings or other structures, or a professor of engineering, government timber expert or railroad architect shall be eligible for active membership. . . .

Mr. R. H. Reid (L. S. & M. S. Ry.), the President of the association, greatly facilitated the progress of the discussions by refraining from having read the printed papers which had been previously distributed among the members. These papers were read by title and were then followed by the discussion on the floor, a system well worthy of adoption by many other technical societies, where at present most of the time of each meeting is taken up by the tiresome verbatim reading of papers which have been in the hands of the members for some weeks previous to the meeting. The discussions of this society are carried on by committee reports, some on subjects of passing importance and some which succeed from year to year. These various committee reports, the matter in which is largely procured from letters from various members, will now be taken up in detail.

GASOLINE OR KEROSENE ENGINES FOR WATER-SUPPLY, DRAWBRIDGES, ETC.—Only one or two members had had any experience with the use of kerosene engines in their work, so that the entire discussion turned to the relative efficiency of steam and gasoline power plants, principally in the supply of water to tanks and troughs. The committee, from various letters, reported as follows:

The cost of fuel determines in a large measure the type of plant to be used. As a usual proposition, there is practically no saving in using gasoline, instead of coal, where the labor required cannot be used in connection with other work. The simplicity of installation and ease of operation of gasoline pumping plants make such systems preferable for water stations, in many situations, and since the cost of fuel is a matter of much importance, it is desirable to use a fuel which is as cheap as possible.

Kerosene, which has a heat value 10% greater than that of gasoline yet costs only about one-half as much, is being used in internal combustion engines, designed for gasoline as a fuel, with some success. It appears, however, that some modification in the cooling system is necessary in order to keep the temperature of the cylinder higher and that the engine must be started with gasoline in the usual manner. Also, because kerosene is dirtier, closer attention is required in keeping ignitor and various parts clean.

In summing up conclusions it may be said that our experience with kerosene in engines designed for gasoline is not yet broad enough to make any accurate statements concerning the economy of its use, although, in comparison with gasoline where both have been tried in the same plant, it is cheaper. For the large supply of water, steam gives the best results, as well as in cases where a small supply is desired. As to whether gasoline should be used in a pumping station, this is dependent upon volume of water to be pumped. The data show that gasoline is more economical where a large amount of water is furnished and where the pumper performs other work in connection with pumping. For quick and efficient service required on drawbridges, turntables, etc., where the engine is used intermittently, gasoline may be considered as the best motive power with the exception of electricity.

DWELLING HOUSES AND CARS FOR TRANSIENT WORKMEN.—Although this committee was appointed to report on "Modern Dwelling Houses for Section Foremen and Section Men in Outlying Districts," its report this year covers only cars used as dwellings by the various gangs employed in construction and repair, the remainder of the subject to be taken up next year. Every railway has in its employ bridge gangs, painters, erectors and others who are constantly employed at various places along the road, but who are never long enough in any one place for them to establish permanent homes. Gradually the managements of the roads are becoming impressed with the necessity for suitable dwellings for these men, realizing that the more cleanly and comfortable their homes, the better the work they do. Formerly the dwelling cars were mere box cars with bunks, unsanitary, uncomfortable and crowded, but now on most of the roads, full trains are provided for each gang, the number of cars in the train depending upon the size of the gang. Usually the trains consist of a combination work-car and foreman's office and sleeper, a tool and supply car, a dining and lounging car and a dormitory car for the gang, although in the smaller trains these several cars are often combined. It has been found advisable to provide cooking and eating facilities, the provisions being paid for by the men, and comfortable lounging and reading rooms, since both of these tend to keep the men in the train and away from the less pleasant activities of the town near which the car may be. The report shows plans of several of these cars, most of which have been constructed at small extra cost from box and passenger cars in service on the road.

WATERPROOFING OF CONCRETE COVERED STEEL FLOORS.—The consensus of opinion regarding this subject is reported by the committee as follows:

The reports indicate that in all waterproofing either some asphalt or tar is used, the tendency being more and more in the line of pure asphaltic compounds. In the majority of cases at the present time either a felt or a fabric such as burlap is used, which is thoroughly saturated and bonded together with an asphaltic preparation, being generally applied when hot by the use of brushes or mops. In other cases the asphalt is used in a mastic form without any felt covering or fabric being introduced. This matter is still in an experimental stage with most of the railways. Considerable work is being done along this line, but sufficient time has hardly elapsed to fully determine the value of the different kinds of waterproofing with regard to durability and effectiveness.

The cases reported are for the most part on trough or buckle plate floors on which is laid concrete overtopped with the ballasted tracks and in the more successful instances the waterproofing upon the concrete was protected from the puncturing effect of the stone in the ballast by a layer of tile or flat brick well grouted together with the hot waterproofing compounds. In some cases, however, this protection was secured by sand, or a selected dirt fill. Many roads report that in plate-girders, provided with solid floors, the floor-system is left open for a space of a few inches immediately alongside the girders, on account of the difficulty in making an effective water-tight joint between the horizontal and vertical planes. When this opening is not left, an outstanding horizontal angle is riveted to the main girders, under which the concrete floor and waterproofing is stopped, thus affording a protection against any downpour of water.

REINFORCED-CONCRETE CULVERTS AND SHORT SPAN BRIDGES.—This report consisted mainly of a description of the standards

of small reinforced-concrete structures, designed by Mr. C. F. Loweth (Chicago, Milwaukee & St. Paul Ry.). The conclusions drawn from numerous small bridges and culverts on that road are that for spans up to 10 ft., the rectangular flat-top design is the most economical, but above that the arch section will prove much better in every way. Many roads reported that wherever possible they were substituting concrete for pipe and wooden culverts.

PRESERVATION OF TIMBER.—This report of a standing committee, a continuation of several previous reports, recounts the various processes of preserving timber now in use which have been described in many other conventions and government reports, and calls attention to the increasing need of some methods of caring for our depleted timber supply. One new process, recently used in England, is described. This is the Powell Process, in which the sap is replaced by saccharine in expensive or molasses in cheap wood. The essential part of the method consists in boiling the wood in a solution of sugar and water, after which it is dried and is ready for use. The report says:

> The claim is made that on account of the boiling point of sugar being higher than that of water, the moisture contained in the wood is converted into steam and escapes in the same manner as the released air. The moisture and air having been completely driven out, the solution is permitted to cool, during which stage it is constantly absorbed by the wood. In this way the cells and interstices are filled with sugar; and, when the wood is dried, the sugar is found to be thoroughly assimilated by its tissues. Whether timber treated in this manner will give satisfactory results under all conditions the committee has not been able to ascertain.

As a matter of general record the following items of cost of treatment in creosoting timber are given:

> Yellow pine square timber, 8 lbs. of oil per cu. ft., about $12.50 per M. ft. B. M.
>
> Yellow pine square timber, 12 lbs. per cu. ft., about $16.00 per M. ft. B. M.
>
> Yellow pine square timber, 16 lbs. per cu. ft., about $20.00 per M. ft. B. M.
>
> Yellow pine piling, 12 lbs. per cu. ft., about 20 cts. per cu. ft.
>
> Piling, 18 lbs. per cu. ft., about 24 cts. per cu. ft.
>
> These prices are based on the price of oil about 7½ cts. per gal. delivered at the creosoting works, and the cost of labor, fuel, etc., about $4.50 per M. ft. B. M. To this must be added the interest charge on plant, depreciation of plant and profit.
>
> For Burnetizing bridge ties, using ¼-lb. of 100% solution of chloride of zinc per cu. ft. of treated timber, $1.90 per M. ft. B. M., at the works.

SMOKE JACKS FOR ENGINE HOUSES.—On account of the peculiarly hard service to which they are subjected smoke jacks are among the most troublesome features in an engine round-house. The gases from the locomotive stacks rapidly corrode any metal with which they come in contact and possible sparks make wood for jacks a dangerous material. Proper firing and fuel reduce the wear or danger to the jacks, but economy prevents changing fuel for this purpose, and carelessness in firing can hardly be avoided, so any decided change will have to come in the material of which the smoke-jack is made. In the past metal, mainly cast-iron, has been largely used, but corrosion requires its replacement about every three years. Wood also is being largely used, and when proper care is taken for the first few weeks of use, the development of a coating of soot renders the wood largely fireproof. However, insurance underwriters do not regard timber with much favor for this use. Asbestos and asbestos compounds have been used quite successfully of late, but have not been in service sufficient time to be recommended. The committee reports that until these asbestos compounds have been more thoroughly investigated the wooden jack, properly designed and carefully watched, should prove of most value.

ERECTING TRUSS BRIDGES.—This report consists mainly of accounts by various engineers of the erection of certain bridges on their lines. It is interesting to note that the railways replying to the questions consider that in most cases it is cheaper for the road to erect bridges with its own gang than to employ contractors. One engineer writes that this is the case provided the railway has an inspector on the work who acts as timekeeper and also performs the same duties that would be expected of him if the job were being done by contract. In this way the foreman has another man back of him to insist on good work and can get better results from his men.

In another report a committee gives the list of tools required by a bridge construction and repair gang.

VARIOUS COMMITTEE REPORTS.—The following committees did not procure enough information to make a report at this time advisable: "Protection of Structures against Effects of Electric Currents," "Fire Protection," "Fences, Road Crossings and Cattle Guards," and "Coaling Stations and Cinder Pits." The reports on "Protection of Embankments from the Effects of High Water by Riprap or Otherwise," and "Pile and Frame Trestle Bridges," were published in full in our issue of Oct. 15.

OFFICERS.

Following the custom of the society the officers were moved up in regular succession, so that the President for next year is Mr. J. P. Canty (Boston & Maine R. R.) and the First Vice-President, Mr. H. Rettinghouse (Chicago & Northwestern Ry.). The Secretary, as continued, is Mr. S. F. Patterson (Boston & Maine Ry.), Concord, N. H. Next year the annual convention will be held in Jacksonville, Fla.

TEST OF THE NEW HIGH-PRESSURE FIRE PROTECTION SYSTEM IN NEW YORK CITY.

A spectacular exhibit of fire streams from the new high pressure mains in the Borough of Manhattan, New York City, was made on the afternoon of Thursday, Oct. 22, at West and 12th Sts. The hose streams used were supplied from eight hydrants, from each of which were run four lines of 3-in. high-pressure hose. The delivery nozzles were arranged in a line extending entirely across the broad plaza in front of the steamship piers on West St., covering a width of some 300 ft. In the first part of the test, streams were discharged from 26 nozzles, placed on tripods; 14 of the nozzles were 2 ins. in diameter, and 12 were 1¾ ins. At the beginning of the test the eight hydrants were opened and allowed to discharge under the normal pressure from the city water mains, which, of course, gave a very slight flow from the nozzles, only rising a few feet above the pavement. After two minutes of this discharge, two pumps in the high-pressure pumping station were put into action, and then at short intervals four additional pumps were started, raising the pressure at the Gansevoort St. Pumping Station to 270 lbs. A view of the array of hose streams discharging under these conditions is shown in the accompanying Fig. 1. The view, however, is inadequate to represent the full volume and force of the streams, which are estimated to have been discharging as much as 28,000 gallons per minute.

FIG. 1. STREAMS PLAYING FROM 26 NOZZLES.

FIG. 2. STREAMS FROM A WATER TOWER, FOUR STANDPIPES AND TEN 2-IN. NOZZLES.

EXHIBITION OF FIRE STREAMS FROM THE NEW YORK HIGH PRESSURE WATER SUPPLY SYSTEM, OCT. 22, 1908.

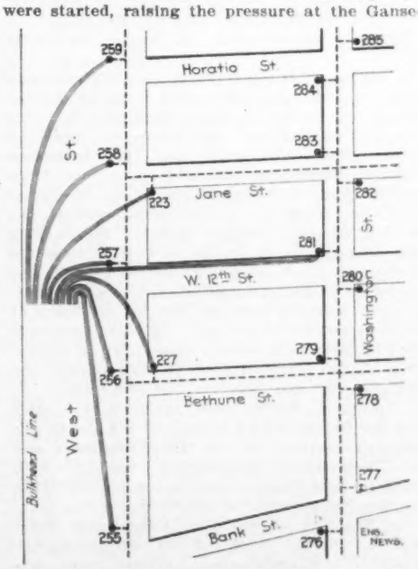

Fig. 3. Plan of Hose Connections from High Pressure Hydrants.

The streams from the larger nozzles under the highest pressure reached from 100 to 150 ft. above the pavement.

After the conclusion of this exhibition, four fire department wagons, with stand-pipes mounted thereon, were wheeled into position in the line, and also a water tower. Two of the 3-in. hose lines were connected to each of these stand-pipe wagons, and on the water tower two hose lines supplied the deck pipe and two the high nozzle. In addition the 20 hose lines from the remaining five hydrants were siamesed into ten 2-in. nozzle streams. After these nozzles were connected, the water was again turned on as in the first test, and the power and height of the streams surpassed anything, it is believed, ever before seen in New York City. The water was thrown far above the top of the adjacent 12-story building of the Western Electric Co., which faces on West St. In addition four streams from the stand-pipe in this building were put into action simultaneously, throwing water from the roof and gave an impressive exhibit of the value of water delivered at a high elevation for extinguishing fires.

The test was carried out under the joint direction of the Department of Water Supply, Gas & Electricity, of which Mr. I. M. de Varona is Chief Engineer, and the New York Fire Department.

ANNUAL MEETING OF THE AMERICAN GAS INSTITUTE.

The third annual meeting of the American Gas Institute was held at the United Engineering Societies Building in New York City, Oct. 21, 22, 23 and 24. The total registration for the convention was 564. The entertainment features included excursions to gas and electricity plants about New York, theater parties, a banquet and an excursion to West Point.

The Beale Medal for prize papers presented at meetings of the institute were awarded by special committees as follows: for 1905, to Mr. H. L. Rice for a paper on High-Pressure Distribution; for 1906, to Mr. W. H. Gartley for a paper on the Delivery of Uniform Candle Power through all Seasons of the Year. The medal was not awarded for 1907, as that year's committee had judged no paper worthy.

The following officers were elected for the coming year.

President, C. F. Prichard, of Lynn, Mass.

Vice-Presidents, W. H. Gartley, of Philadelphia; Donald McDonald, of Louisville, Ky.

Secretary-Treasurer, A. B. Beadle of Philadelphia.

In the report of the Technical Committee it was stated that in the future the work of the institute would be handled generally by two standing committees, the Technical and the Public Relations, with any subcommittees which it might seem advisable to appoint from time to time. A subcommittee of the Technical Committee reported a resolution, which was adopted by the meeting, defining the heating value of a gas as the number of B. T. U. liberated by complete combustion, with air, of 1 cu. ft., the gas being measured at 60° F. and under a pressure of 30 ins. of mercury and the air being at the temperature of the gas. This is practically what is commonly called "gross heating value," although the committee refused to recognize the terms "gross" and "net" in this connection.

A special committee was appointed to confer with the United States Bureau of Standards, the American Institute of Electrical Engineers and the Illuminating Engineering Society, with power to take final action, in the matter of an international standard of candle-power.*

The Trustees of the Gas Educational Fund reported on the work of its correspondence classes in gas engineering. Fifteen men completed the course with the 1908 group, and the '09, '10 and '11 groups contain 19, 33 and 49 members respectively. $4,551.20 was available for the year ending Sept. 30, '08, and $3,994.34 was spent in carrying on the work.

*The matter of an international standard was more fully discussed in the report of the convention of the Illuminating Engineering Society, Engineering News, Oct. 15, 1908.

The address of the President, Mr. Alexander C. Humphrey, President of Stevens Institute of Technology, was divided between the internal affairs of the institute and the activities of public-service commissions. It was stated that every effort should be made to make the American Gas Institute the authority on the generation, distribution and accounting sides of the gas industry, and that the institute should work for a fair treatment of the public. The necessity of a certain amount of oversight or control over public utility concerns by the public was admitted, as was the advisability of instituting such control early in the companies' history, so that there need be no necessity of stringent regulation later. As an example of proper control, Mr. Humphrey drew attention to the Massachusetts boards and as an example of a highly undesirable commission the New York State bodies were cited. The fault found with these latter were in the powers granted by the legislature which, it was claimed, gave them virtually legislative, executive and administrative powers simultaneously. Such "government by commission" was held to be "the beginning of the downfall of a republican form of government."

Mr. W. A. Castor, of Philadelphia, presented a report of the progress in the use of dipping gas meters (meters in which oil is used to keep the leather diaphragms non-porous) in Philadelphia. It was claimed that the results showed that the superiority of dipping over non-dipping meters, along all lines previously claimed, had been demonstrated. It was said, also, that with meters removed for testing the passage of dry air (or gas) from the prover dried out the diaphragms so that it became faster for each successive test. It was claimed that some means should be taken to have the air (or gas) from the prover saturated, and that the first test only should be taken to show conditions in service.

Mr. E. H. Earnshaw, of Newark, N. J., presented the "Theory of Benzol Enrichment." The laws stated governing the enrichment of air or a fixed gas with pure benzol are those governing the evaporation of water vapor. It was also shown that the real problem was much more complicated as the gas to be fixed was not a simple fixed gas but is already partially saturated with hydrocarbon vapors, and as the commercial "benzol" was a mixture of benzol, Toluol and xylol, each with a different vapor tension at the same temperature. The increase in candle power of gas by the absorption of "benzol" vapors or the decrease in candle power for a drop in temperature, due to condensation of such vapors, are then to be determined by actual test. The author emphasized the individuality of each case where it was proposed to enrich with benzol vapor and the need for studying each case as an independent problem and in the light of the laws outlined.

Mr. T. J. Litle, Jr., of Gloucester, N. J., read a paper on "Better Gas Illumination," in which he showed the scientific application and adoption of modern mantle lamps in place of older types.

Mr. C. O. Bond, of Philadelphia, gave "Some Further Remarks on the Photometry of Gas," in which he discussed (1) the use of hoods or pipes over the lamps for removing the foul gases so troublesome in gas-photometry laboratories, (2) the use of comparison screens of higher accuracy and the employment of more competent photometrists, (3) reference and working standards, (4) proper test burners, (5) future practice.

The report of the Sub-Committee on Calorimetry was a compilation of historical matter and studies carried out by the committee at the University of Wisconsin. The calorimeters described were principally the Junkers, Boys, Simmance-Abady and the Sargent—all of that type in which the gas is burned under prescribed conditions and the heat developed is absorbed by a known weight of water passing through the instrument.

Mr. J. D. Von Maur, of St. Louis, presented a paper on "High Pressure Gas Distribution." This was largely a description of the scheme worked out for St. Louis to adapt the old system to the needs of the growing city. It is planned to place a manhole in each square mile of the city's area and to locate here a governor which admits gas from a high-pressure pipe to the low-pressure local distribution lines.

The report of the Committee on Uniform System of Accounts related the conferences held with the Public Service Commissions of New York State. The committee reprinted the tentative scheme evolved and expressed its warm appreciation of the courteous consideration received at the hands of the Commissions.

"The Physical Theory of Coal Carbonization" was the title of a formidable paper by Mr. W. H. Fulweiler, of Philadelphia. This gave first a resumé of the historical development of the coal-gas industry and in the methods of supplying heat for coal carbonization—the driving off of all the volatile matter. The effect of the composition of coal, the process of carbonization, the composition and distribution of products, formation of impurities and effects of time, pressure and foreign products in the retorts are all discussed with references to the latest knowledge and experiment. The paper shows that, from the author's standpoint, the conditions dictated by theory for the best production of coal gas are nearly the opposites found in practice and necessary from practical considerations.

Vertical retorts, for coal carbonization, as installed at Lyons, Marsailles, Zurich, Cologne, Mariendorf, Oberspree, and Manchester, N. H., U. S. A., were critically described in a paper by Mr. J. H. Taussig, of Philadelphia.

Methods of using steam for keeping water, in gas-holder cups and tanks, from freezing were described in a paper by C. J. Ramsburg, of Philadelphia. These methods involve the use of steam by injectors. The best designs of simple injectors and fastenings for flexible-hose fastenings were outlined.

Mr. F. M. Speller, of the National Tube Works, Pittsburg, presented a paper on "Modern Wrought Gas Pipe." He chiefly cited the experiences that had come under his observation in studying the relative corrosion of steel and wrought-iron pipes of comparatively small diameter. The conclusion he had arrived at was that the comparison of old steel and iron showed no advantages of one over the other, but that as new processes had been developed, to secure a more homogenous material, more resistant to corrosion, present steel pipe could be expected to be better than wrought iron from the point of durability alone.

THE PINTSCH GAS LIGHTING SYSTEM is now in use on over 156,000 railway cars and locomotives, according to a statement just issued by the parent Pintsch company at Berlin. The increase in four years has been over 35,000 cars. Germany leads in the number of cars equipped, the total number being 52,846 and nearly 8,000 locomotives in Germany are also equipped. The United States comes next with 32,455 cars equipped and then follow England with 20,450 cars, India with 13,686 cars and France with 11,914 cars. It may be noted, however, that the large size of American cars compared with European and the much more lavish use of light in American cars make it practically certain that the United States leads all other countries.

A CENTRIFUGAL PUMP FIRE ENGINE has been made and tested by Dennis Bros., of Guildford, England. The engine used is a four-cylinder, four-cycle, gasoline automobile engine of 40 HP. Ignition is effected by means of a high tension magneto apparatus, and a battery and coil system with a separate set of spark plugs is provided for use in case of accident to the magneto system. A four-speed change gear transmits the power for the propulsion of the car through a shaft drive to the Dennis worm gear on the rear axle. The centrifugal pump is of a type known as Gwynne & Sargeant's patent and is supplied by a 5-in. suction line. Brackets are provided at the side of the vehicle to carry two 10-ft. lengths of 5-in. hose coupled up ready for use. The pump is mounted at the extreme rear of the car and is driven by a separate shaft drive geared to the engine shaft at the forward end. A water tank is provided for priming. The engine and pump is described as being capable of discharging from 350 to 400 gals. per min. at a pressure sufficient to supply two ¾-in. jets and deliver to a height of 120 ft., and better results are obtainable if the pump be connected to a main carrying water under pressure. Seats are provided on the car for eleven men including the driver.—"The Contract Journal," Oct. 7, 1908.

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The burning of the Albany Day Line steamer "New York" while tied up to a pier at a Newburgh shipyard is another object lesson illustrating the extreme combustibility of American steamboat construction. The hull of the vessel was of steel, but the great quantity of wood in her interior fittings made a fire so fierce that the Newburgh fire department were not only powerless to save the vessel but had great difficulty in preventing the fire spreading to the shipyard buildings and other vessels on the stocks. It is true the vessel's own fighting equipment was useless, there being no steam on her boilers and that the fire broke out at midnight, when all the crew left on board her were asleep save for one night watchman. Nevertheless the rapid destruction of the vessel, and the loss of life on board her, certainly ought to call renewed attention to the need for reform in current methods of steamboat construction. Even if we cannot dispense wholly with the use of wood on shipboard, we can use less pine and more asbestos, less flimsy "gingerbread" trimming and decorations and more partitions of incombustible material. The question whether an accidental fire shall effect complete destruction or be quenched is merely a question which shall work the faster, the fire fighters or the flames.

Because the heavy rainfall of last spring caused a considerable amount of water to flow over the waste weir of the Croton dam, some New York City newspapers embarked on a campaign against the new Catskill supply as an unnecessary extravagance. The drought of summer and fall has put an effective quietus on that campaign. Notwithstanding the fact that the reservoirs were all full and overflowing in May, the steady drafts during the months of light rainfall since have reduced the storage in the reservoirs at the present time to about 50,000,000,000 gallons, according to published statements. Of course New York is still a long ways from a water famine, and it is to be hoped that ample rains during the winter months will again fill the Croton reservoirs; but in view of the enormous interests at stake, all who understand the situation will feel more at ease as the work on the Catskill supply advances toward completion.

May not a public water supply from underground sources be likened to a bridge with an unknown factor of safety? The bridge may have ample strength for any load that can come upon it, but on the other hand it may be seriously near the danger point. So, too, the water in the underground reservoirs *may* be sufficient for all demands in the longest drought; but on the other hand nobody knows how much there is to draw upon at any time or when the supply may fail.

During the protracted drought of the past two months many towns and cities have been reduced to sore straits for water; and there have been some notable instances where supplies from wells and springs have failed. We are by no means condemning underground sources of water supply. Such waters often have great advantages over any available supply from surface streams. It should be clearly understood, however, that the original source of an underground stream, as of a surface stream, is the rainfall, and that the storage between the rainfall and the point where the underground stream is impounded as a spring or well, cannot be measured as we measure the water in a reservoir on the surface.

As a result of the drought of 1908, it is likely that many towns which take their ordinary supply from underground sources will provide an emergency plant by which surface streams can be drawn upon. Further, while engineers understand fully the importance of large storage in any public water supply from surface streams, the great drought has brought that truth home to people in general. Many storage reservoirs will be constructed as a result of the experiences of the past few weeks.

We call the special attention of any of our readers interested in automatic stop devices for railway trains to the report of a committee of the Railway Signal Association, printed on p. 465 of this issue. Automatic stops are being exploited before the public in many different ways and it is common to hear the railways assailed for refusal or delay to adopt them. The enthusiastic inventor of a safety device believes that all the railways need to do is to put his invention into use and accidents will disappear as if by magic.

But railway officers charged with responsibility for the safety of thousands of lives and millions of property cannot adopt an innovation without inquiring what consequences are to follow. Many if not most of the "safety devices" invented would produce greater dangers, if actually put into use, than those they are designed to avoid. We have in former issues of Engineering News explained some of the serious difficulties in the practical application of the automatic stop to steam railway service. The Signal Association Committee's report shows further what difficulties must be met if an automatic stop is to be really a safety device and not a cause of disasters.

New York City is well known to lack funds for greatly needed public improvements, particularly for additional Rapid Transit subways. In many other directions, too, the needs of the city increase faster than the available revenue from taxation. In the face of these conditions, it is passing strange why the city authorities should go calmly forward with the plans for that monstrosity in engineering design, the proposed 700-ft. concrete arch over Spuyten Duyvil Creek. While the structure has been projected as a memorial to the explorer, Hudson, it could not possibly be completed till long after the Hudson Memorial celebration to be held next year. Further, the Public Service Commission notified the Board of Estimate recently that the building of the bridge was not needed as part of any rapid transit system. As we showed in these columns months ago, nobody knows how the bridge can be built, or what it will cost or whether it can be built at all. New York cannot afford to sink eight or ten million dollars in this structure. If the New York authorities persist in carrying forward this foolish enterprise we venture the guess that somebody besides Henry Hudson will be remembered before it is done.

BREAKDOWN OF SERVICE IN ELECTRIC RAILWAY OPERATION.

Concerning the question whether electric operation of main-line railways has proven successful in those cases where tried, we already have the very enthusiastic statement made by Mr. W. J. Wilgus some months ago before the American Institute of Electrical Engineers. Recently the New York, New Haven & Hartford Ry., through its Electrical Engineer, Mr. W. S. Murray, has also put forward an optimistic statement. Mr. Murray said:

> The most commercially valuable answer as to the success of electrification on the New Haven is written in the actual operating schedule in the electrification zone. *The train-minute delays suffered to-day by electrical operation are but a small percentage of those incurred during the period of steam operation.*

It happened, unfortunately, that on the same day this statement came before us, Oct. 16, the New Haven electric zone was entirely paralyzed for a period of several hours. Not a train could be moved. As this mishap occurred during the morning commuting rush, the inconvenience of the tie-up was felt to its fullest extent. Such interruptions of traffic do not speak very favorably for "electrification," even though, when averaged over a month, they show only a small average delay per train.

There is evidently truth in the old argument that electric operation of railways is open to the danger of having the whole system laid idle when an accident happens, whereas on a steam-locomotive system the worst interruption is only local.

To guard against a hasty assumption that the liability to such breakdown of service is peculiar to this or that "system" of electric operation, we must refer also to the recent tie-up of several lines of the London Underground Electric Railways Consolidation, on Oct. 3, a tie-up of several hours' duration. This occurred on a direct-current third-rail system, while the New Haven, of course, uses overhead high-tension single-phase trolley. The only difference between the two accidents is that the one in London was purely a power-house accident, while that on the New Haven was primarily due to the overhead trolley system.

A reference to the causes of these interruptions may be interesting. On our inquiry, Mr. Murray sends the following statement in explanation of the New Haven trouble:

> The cause of our difficulties on Friday, the 16th [Oct.], was due to a peculiar combination of circumstances, which I can hardly believe will be duplicated in the future; the direct cause of our disturbance was on account of our signal wires coming in contact with the single-phase system and the failure of the circuit breaker apparatus to handle the short circuit resulting. Coincidently with this happening, our arrangement of connections at the power-house were of a temporary nature, to which can be attributed the delay in getting the power back on the line. The permanent connections will, of course, preclude this unfortunate difficulty in the future.

The London accident was just as serious, in spite of the fact that the power-house had permanent connections. The "Electrician" of Oct. 9 gives a detailed statement by Mr. J. R. Chapman, Chief Engineer of the system, from which the following is extracted:

> The initial cause of trouble was a "short" between the primary and secondary windings of a series transformer in one of the conductors between a generator and its oil switch. . . . The frames of these transformers, and one point in the secondary leading to the control board, are earthed. The copper earthing strips in the Chelsea generating station are of very large capacity and, of course, it only took a few seconds to develop sufficient internal pressure in the transformer to cause it to explode. After passing through the transformer, the machine cable is carried vertically through porcelain insulators in the concrete floor above and into brick compartments containing the oil switch. In this instance, the force of the explosion drove the arc and flame up through the insulators, thus short-circuiting the cables leading to and from the base of the oil switch. The opening of this switch failed to disconnect the machine cables from the bus bars. This bus bar is divided into five sections and oil switches of large capacity couple these sections. The surge of current, however, owing to the earthing of one phase, was so great that a number of the static dischargers on the feeder cables were overtaxed and bridged, so that it became necessary

to completely shut down in order to clear up the earth connections through the safety devices. The total damage was trifling. . . . It took some little time, however, to clear up the earth connections on the 186 static discharge panels and thus make sure that it was safe to again put 11,000 volts on the bus bars. . . . Of the 357 miles of three-phase cable to the substations there was not a single failure.

That a large loss is caused by interruptions of this sort is rather obvious. We believe the ordinary tendency is to underestimate the loss. A mere time-value appraisal is perhaps the only definite calculation that can be made, and of course this is highly artificial. Using this method, we might figure that a delay of four hours during the rush period of the day, on a line transporting the moderate number of 10,000 persons per hour, would produce an average delay of 2 hrs. for 4 × 10,000 persons, and at a blanket valuation of 50 cts. per hr. this would show a loss of production of $40,000. Interruptions of this cost would not need to come very frequently to be equivalent to a very respectable capital value.

Evidently, methods and devices for preventing such interruptions are worth while, even at high cost. Continuity of service has a large cash value. Even though the revenues of the public-service corporation be not greatly affected by interruptions, yet it is evident that sound engineering will require that electric railway equipment be surrounded with all possible safeguards against failure of the entire system. We had occasion to make a similar argument only a few weeks ago (Aug. 20, 1908). The cases here cited, however, raise the question anew in so much clearer form that the argument is strongly reinforced.

THE RELATION OF FORESTS TO STREAM FLOW.

It is a fixed belief in the popular mind that the forests of a region have a strong influence on the flow of its streams. Probably most people of intelligence are well convinced that the removal of forests is largely responsible for the destruction wrought in recent years by great floods and likewise for the drying up of streams in time of drought. Many also hold the belief that forests have an actual influence on the climate, increasing the amount of rainfall. The advocates of forest preservation in this country have seized upon these popular beliefs and are using them with telling effect in their campaign for the maintenance and increase of Government forest preserves.

Now on what scientific basis do these popular beliefs rest? What evidence is there to show that deforestation has increased floods or decreased the low water flow of our rivers?

There has been considerable discussion of this subject in the past among engineers; but we recall no discussion at once so vigorous and so radical as that which is just now made by Col. H. M. Chittenden, of the Corps of Engineers, U. S. A. Col. Chittenden's discussion has taken the form first of a very long paper in the Proceedings of the American Society of Civil Engineers for September,* which is to come up for discussion at the meeting on Nov. 5, and second of an elaborate paper contributed to this issue of Engineering News. Both these papers deal chiefly with the subject noted above—the relations of forests to stream flow, although in the second part of his American Society paper, Col. Chittenden discusses the storage reservoir scheme of Mr. M. O. Leighton in a manner to which we shall refer later.

Confining ourselves now to Col. Chittenden's remarks on forestry, it is proper to say at the outset that he proclaims himself a friend to forest preservation. He declares that forests are well worth preserving and re-creating because of their timber product, as well as their advantages for scenery and recreation. He believes, however,—and none will question the sincerity of his belief—that the stock arguments for forest preservation because of the relation of forests to floods, low water and even protection of the soil from erosion, are all founded on popular fallacies.

In his American Society paper Col. Chittenden sums up his position respecting forests in seven conclusions, which we reprint in full below, since they summarize fairly well also his argument presented in the paper in this issue.

(1) The bed of humus and débris that develops under forest cover retains precipitation during the summer season, or moderately dry periods at any time of the year, more effectively than do the soil and crops of deforested areas similarly situated. It acts as a reservoir moderating the runoff from showers and mitigating the severity of freshets, and promotes uniformity of flow at such periods.

(2) The above action fails altogether in periods of prolonged and heavy precipitation, which alone produce great general floods. At such times the forest bed becomes thoroughly saturated, and water falling upon it flows off as readily as from the bare soil. Moreover, the forest storage, not being under control, flows out in swollen streams, and may, and often does, bring the accumulated waters of a series of storms in one part of the watershed upon those of another which may occur several days later; so that, not only does the forest at such times exert no restraining effect upon floods, but, by virtue of its uncontrolled reservoir action, may actually intensify them.

(3) In periods of extreme summer heat forests operate to diminish the runoff, because they absorb almost completely and give off in evaporation ordinary showers which, in the open country, produce a considerable temporary increase in the streams; and therefore, while small springs and rivulets may dry up more than formerly, this is not true of the larger rivers.

(4) The effect of forests upon the runoff resulting from snow-melting is to concentrate it into brief periods and thereby increase the severity of freshets. This results (*a*) from the prevention of the formation of drifts, and (*b*) from the prevention of snow-melting by sun action in the spring, and the retention of the snow blanket until the arrival of hot weather.

(5) Soil erosion does not result from forest cutting in itself, but from cultivation, using that term in a broad sense. The question of preventing such erosion or soil wash is altogether one of dispensing with cultivation or properly controlling it. The natural growth which always follows the destruction of a forest is fully as effective in preventing erosion, and even in retaining runoff, as the natural forest.

(6) As a general proposition climate, and particularly precipitation, have not been appreciably modified by the progress of settlement and the consequent clearing of land, and there is no sufficient reason, theoretically, why such a result should ensue.

(7) The percentage of annual runoff to rainfall has been slightly increased by deforestation and cultivation.

It follows that no aid is to be expected in the control or utilization of our rivers, either for flood prevention, navigation or water power, by any practicable application of forestry. Remember always that it is the extreme of flow, not the medium condition, that controls the cost of river regulation. It is the floods and low waters that measure the cost. Any scheme of control that is not based upon these is worthless.

We believe that most engineers who give careful study to the question will find themselves forced to accept fully Col. Chittenden's most important conclusion given under (2) above, viz. That forests do not prevent floods. Theory is not needed to settle this point; nor do we even need to go back and study the record which he quotes of eight centuries of floods on the Danube River. It is perfectly well known that great floods occurred in the rivers of New England, the Middle States and the South when the entire drainage area about their sources was covered with primeval forests. We could not in centuries, by the utmost endeavor which the most enthusiastic forestry advocates suppose possible, restore such forests as then existed, and even if we could, floods would still occur as they occurred then.

Readers of Engineering News editorial pages may recall how the popular fallacy that forest preservation can prevent floods was combated by us a year ago, the specific case being the claims made that the floods in Pittsburg could be prevented by forests about the headwaters.* So far as this part of Col. Chittenden's paper is concerned, therefore, we are in full agreement with him.

But from most of the other conclusions reached by Col. Chittenden we find ourselves compelled to dissent, in greater or less degree. We believe that Col. Chittenden, when he talks about stream flow and the effect of forests thereon, has chiefly in mind the great rivers or those for navigation, with which his profession has chiefly to do. He claims—and with much show of reason—that on the large rivers forest cover on their basin does not increase the low-water flow. His argument is that a river like the Ohio for example, will receive more water during a dry, hot summer when a local thunderstorm falls on a smooth area of cleared land and nearly all runs into the stream than it would if the same storm fell on a forest covered area where it would be largely absorbed by the forest litter.

Forests, therefore, do not help on the navigation engineer who has to do with large rivers; and yet—and here is where we find ourselves compelled to differ from Col. Chittenden—they may help out materially the water supply engineer. It seems to us the weight of evidence indicates that forests do tend to maintain the low water flow in small streams. Col. Chittenden himself almost admits this in his conclusion (1) where he shows how under all but exceptional storms the forest cover acts as a reservoir. Manifestly it cannot store up the rainfall and retard the runoff as he says it does without increasing the flow later.

And here it may be noted that there is a vast difference between different forests in different localities and climates. There are forests undoubtedly where the cover of leaves and humus would not absorb over half an inch of rainfall before rapid runoff would begin. There are other forests where several inches of rainfall might be absorbed without causing anything like high water in the streams flowing from the forest.

Col. Chittenden in his conclusion (3) admits that small springs and rivulets *may* dry up more than formerly. Is it not a fact that all through the Appalachian section at least, the brooks do dry up more than they used? Is not the common observation of this phenomenon by people generally the real explanation for the popular belief regarding forests and stream flow which we referred to at the outset of this article? Is it not the case that the people are right, actually, in their observation of the small streams and that the fallacy—which Col. Chittenden is properly combating—consists in applying the same rule to large streams.

Unless we are greatly mistaken, observations of small brooks, draining areas say of three or four square miles in any typical section of New England or the Middle States, will show that those issuing from forest lands will have greater flow in times of drought than similar brooks issuing from adjacent cultivated lands of similar slope.

And there is one reason for the regular flow from forest lands that Col. Chittenden seems to have overlooked. That is the effect on underground flow. There is no such profusion of springs in cleared pasture lands for example as is to be found in the forests adjacent. Is it not reasonable to suppose that the spongy cover of the forest soil, holding the water long in contact with the earth would allow it to soak in and reach the underground channels. If anyone doubts this we suggest a simple experiment: Two days after a heavy rain has ceased, go into the forest and dig down to the earth under the cover of dead leaves and humus and note its condition of moisture. At the same time visit a neighboring pasture or cultivated land and make a similar examination.

Much more might be said, but we turn to another of Col. Chittenden's contentions, noted under (2), the idea that the reservoir action of the forest floor may at times operate to actually increase flood heights. That this is a *possibility* must be freely admitted, but we cannot follow Col. Chittenden in his contention that it is a probability. Take for instance such a flood as visited Pittsburg last spring and suppose a stream emptying into say the Allegheny 30 miles above the city. If this stream has a forested watershed, Col. Chittenden thinks the flow from it might be just enough delayed to

*"Forests and Reservoirs in their Relation to Stream Flow, with Particular Reference to Navigable Rivers." Proc. Am. Soc. C. E., Sept., 1908 (Vol. XXXIV., No. 37). The paper will be presented for discussion on Nov. 4, 1908.

*Engineering News, June 27, 1907.

time with the crest of the flood from other sources in reaching Pittsburg, whereas if it flowed from open country its waters might go down stream before the flood reached full height. Perhaps we say again, but by the theory of chances we should think the chances for floods materially lessened if the flow from this watershed were poured out slowly instead of suddenly. Surely whatever tends to prolong the time of runoff and increase the length of a flood wave lessens the height of its crest. That forest cover on a drainage area tends in this direction is practically proved by Col. Chittenden's conclusion (1).

Turning now to conclusion (4), we find a most remarkable theory—that snowfall melts more suddenly in forests than on cleared lands and hence that on watersheds where heavy snows fall the forests actually tend to induce floods from melting snows. The instances cited by Col. Chittenden in support of this view are drawn apparently from the peculiar conditions existent on the highlands of the northern Rocky Mountains, and we can hardly believe they represent typical conditions even there. His argument in brief is that the snowfall in the forest is spread evenly over the ground and is shaded from the sun by the evergreens so that it does not begin to melt at all until late in the spring, and then it all melts suddenly.

We can understand how in the high altitude of Yellowstone Park snow would melt in such a manner, but there are few forests under such conditions. Snow is as often melted in the spring by a warm south wind or "Chinook" or by a warm rain as by the sun. In fact, in the Appalachians, floods from melting snowfall are almost always so produced. The sun's heat alone on snow never causes floods there. Further, the melting snow in the forest is conserved by the forest mold just as is the rainfall in Col. Chittenden's conclusion (1). The fact is that the frost penetrates much less in the forest than in the open. Often very early in the spring the ground in the forest will thaw out under the snow and melting goes on from the under side. Observe two brooks in the winter, one flowing from a forest the other from open land and it will be found that the forest brook runs steadily, when the other on open land may be entirely dry. And while both may be flooded when a warm rain comes on the snow, we are much mistaken if the brook draining the open land does not carry the largest volume of water.

Under (5) Col. Chittenden maintains that soil erosion is not a consequence of forest cutting but of faulty cultivation of land not in forest, and that the underbrush and other growths which follow forest cutting is just as effective in preventing erosion as was the forest cover.

In view of the great damage done by erosion in reducing fertile lands to a desert and in choking stream channels with debris this is a most important matter. That other growths can and do replace the forest as conservers of the soil, *in some locations and climates*, is certainly true. The steep mountain sides of Wales, for example, are destitute of trees or even bushes and have been for centuries probably; but in that damp climate a heavy grass turf easily maintains itself, grows luxuriantly even at the highest elevations, and prevents any erosion. In many sections of the northern Appalachians, too, removal of the forest is promptly followed by a growth of underbrush that protects the surface soil perfectly.

But does this occur at all times and places? Grass does not grow in hot climates as it does in Wales or New England, and on sandy soils particularly, the removal of a growth of pine is apt to leave bare soil, exposed to the action of wind and weather. There are sections in the Adirondacks, in Michigan and in the Southern States where forest removal has left the land a barren sandy waste.

We would call Col. Chittenden's attention to the fact that wind erosion is often as powerful an agent as water erosion in stripping the fertile soil away and reducing land to a desert condition. There are great areas in the South and West as well as those to which he refers in Europe where the wind has done as much damage as is done by the washing of water on the steep slopes of humid regions. Surely it will be admitted, even by Col. Chittenden, that forests will prevent erosion of this sort in a way that no other growth can effect.

We regret to see that Col. Chittenden carries his theories so far as to oppose such measures as the Government reservation of the timber resources in the Southern Appalachians. Even if we admit his position regarding erosion, is he not arguing like an abstract scientist rather than a practical engineer? Suppose it is true that the erosion of the soil in the Southern Appalachians is a result of cultivation rather than removal of the forest. The fact remains that if the forest is removed, some part of the newly cleared and fertile land will be put under cultivation, and erosion is bound to ensue. We do not see, therefore, how the mere fact that other growths will prevent erosion as well as the forest itself lessens the argument for preserving the mountain forests.

Nor are we impressed with Col. Chittenden's idea that forests should be cultivated in the lowlands and other convenient places instead of on distant and inaccessible mountains. The fact is that with the rapid increase in population and pressure on the means of subsistence all our lands are certain to be needed. By all means cultivate forests on lands in the valleys that cannot be better utilized for other purposes; and yet we shall need in the near future all the timber that the mountain slopes can produce.

Space fails us for a longer discussion of Col. Chittenden's paper so far as it relates to forests. With his main conclusion—that forests have little influence on stream flow compared with what is generally believed—we have already expressed our accord. It is when he goes further and almost seems to claim that forests are injurious rather than beneficial to the streams and the land that we find ourselves compelled to dissent.

We referred above to Col. Chittenden's discussion in his "Am. Soc. C. E." paper of Mr. Leighton's proposed reservoir system for the Ohio River. The conclusion which he reaches is that the reservoir system proposed is impracticable. But—begging the colonel's pardon for the comparison—we are reminded of the old story about "those who came to scoff remained to pray," for in his "addendum" to the paper contributed to this issue, Col. Chittenden accepts the reservoir system as the only relief possible from the evils of drought with which the country is now afflicted. Of course we understand that what Col. Chittenden rejects is the reservoir system as a remedy for floods and a substitute for locks and dams in river navigation. But his explicit acceptance of the idea that storage reservoirs have a proper place in any logical system of river regulation is a most important one.

LETTERS TO THE EDITOR.

Experience With Electric Welding of Reinforcing Bars; Cost of Work.

Sir: In your issue of Oct. 1 appears an inquiry "as to the practicability of electric welding in place for concrete reinforcing bars." Your correspondent may be interested in our experience with electric welding of reinforcing bars for the Bannock St. bridge in this city, although the bars were not welded in place.

The work was done on plain 1¼-in. square bars of "high-carbon steel." The transformer was set up just outside of the storage shed, at one end of the bridge site. The bars, in lengths of 10 ft. and 30 ft., were carried by laborers from the shed to the transformer, thence to the power-driven hacksaw where they were cut to length, and finally to their places in the work. There were approximately 36 tons of these bars handled; the number of welds was 384. The work was done by a local manufacturing company, which furnished and set up the transformer and supplied the skilled labor necessary for its operation for 25 cts. per weld, the bridge contractor paying the power bill and supplying the common labor necessary to handle the bars. We have no means of knowing how much the cost of handling was increased by the introduction of the welding operation, but we think it improbable that the work could have been done by fewer men or in less time if the welding could have been omitted. The average time consumed per weld probably did not much exceed two minutes. The total power consumption was 420 KW.-hrs. This was paid for at 4 cts. per KW.-hr with a cash discount of 10%, making a total cost for power of $15.10. Exclusive of the labor of handling, above mentioned, the total cost of the welding was $111.10, being slightly less than 29 cts. per weld or about $3.09 per ton of bars.

It was observed that while the joint was still red hot, and again after it had become entirely cold, the bar could be subjected to any amount of twisting, bending or other violent distortion without any sign of fracture at the weld. There seemed, however, to be a period just after the joint had become black, but while it was still hot, when the weld would part as the result of a smart blow with a hammer or from dropping the bar three or four feet to the ground. In spite of repeated trials we never succeeded in breaking a weld after it had become cold. Yours truly,

Charles W. Comstock.

Boston Bldg., Denver, Colo., Oct. 14, 1908.

A Survey Error in a German Tunnel: Correction of a Sensational Exaggeration.

Sir: The alleged cost of the repairs necessitated by an error in the alinement of a tunnel on a branch of the Black Forest Railways, amounting to $875,000, according to a despatch from Heidelberg dated Sept. 12 and reproduced in your issue of Sept. 24, needs a reduction of about 99.8%. The tunnel in question is about 525 ft. long and cost $40,000. The actual expense caused by a deviation of the heading on a curve was $1,500 (according to the official statement of the government of Sept. 13, enclosed herewith), i. e., about 1/600 part of the amount given in the despatch. The appearance of the misleading, sensational and exaggerating account in the German daily press is surmised to be the outcome of gross ignorance or mean malice, most likely the latter.

Yours truly,

Wm. F. Waag, C. E.

Akademie str. 3 Karlsruhe, Baden, Germany, Oct. 10, 1908.

[The government statement referred to in the above is an official note in the "Karlsruher Zeitung" of Sept. 13, which we translate as follows:

A report in the "Heidelberger Zeitung," which was also printed by a large part of the daily press, alleges that in the construction of a tunnel on the line Weisenbach-Forbach the headings driven from the two ends did not meet in the middle but diverged by eight meters, which, it is further alleged, caused the State Railway administration a loss of 3½ million marks. The occurrence to which this report presumably refers was already brought up in the last proceedings of the Chamber, and was discussed with the government. As is mentioned on pp. 14-15 of the report of the Budget Committee of the Second Chamber on the railway budget for 1908-'09, a query from the committee as to whether the report that errors involving extra cost had been made in the construction of the tunnel at Langenbrand was based on facts, elicited from the government the reply that an error had in fact been made in locating the tunnel axis, but that the cost of rectifying the error had fallen on the contractor. The circumstances involved were that, in starting the bottom heading of the 160-meter Brach tunnel above Langenbrand, about 41 m. of the tunnel heading were excavated off the proper alinement, as the result of a survey error. The mistake was discovered in time to permit the full-section excavation and lining to be done on the correct alinement. The loss to the contractor amounts to about 6,000 M.

The report in the "Heidelberger Zeitung," therefore, is based on a gross distortion of a relatively unimportant occurrence.

This explanation puts a rather different face on the matter. In our notice of the Heidelberg dispatch (p. 339 of our issue of Sept. 24) we pointed out that the triangulation and alinement surveys of tunnels are always so carefully executed and so constantly checked (especially in European practice) that an error of the kind alleged is virtually impossible. This is exactly true, for tunnels of some size. But of course the conditions on small work are materially different; a short 500-ft. tunnel through a rock spur, naturally, is not watched and checked so carefully or frequently that an occurrence of the reduced proportions described might not be at least possible, though not very likely. The 41 m. of heading may represent, say, a fortnight's work, during which period no check survey may yet have been made. The very fact that the mistake was noticed so early proves that a departure from true alinement extensive enough to cost nearly a million dollars to correct (this necessarily occurring on a very large tunnel) is beyond the range of reasonable possibility.

It is worth noting that the official explanation is silent as to the cause alleged in the original dispatch, a survey mark misplaced through malicious vengefulness. This allegation has little

probability in its favor, but if it has any foundation we can only suppose the survey party to have been negligent in its work. Even a 500-ft. tunnel is worth the trouble of setting an alinement monument or mark of sufficiently permanent and distinctive character to be proof against malicious displacing or substitution. A survey party careless enough to omit the ordinary precautions for this purpose would also be unreliable in other phases of its work, so that the error in question might as probably have resulted from a direct mistake as from malicious interference. The former, in fact, is the more probable. In the absence of any published evidence to the contrary we may fairly assume, therefore, that the surveyors simply made a mistake, without the unsuspected assistance of a vengeful ex-employee.—Ed.]

Notes and Queries.

Mr. Harry L. Whitney, of Auburn, N. Y., connected with the New York State highway work, raises two questions regarding details of macadam road construction. His first point is that instead of spreading a 1-in. course of small stones on the rolled subgrade and then spreading a layer of large stones (3½ ins., in New York State), it would be better to mix the two sizes as they come from the screens at the crusher. This, Mr. Whitney believes, would fill the voids better, give a more solid road, and at the same time help the contractor, who generally has a surplus of the smaller stones.

The second point made by our correspondent is that a 10-ton roller cannot compress a 5½-in. bottom layer of stone to 4 ins. and a 2½-in. top layer to 2 ins., especially when specifications call for filling the voids of the bottom course with sand and those of the top course with screenings. The result, he states, is 7 instead of 6 ins. of finished macadam.

If the small stones now used in the first layer are not too small and are well mixed with the main layer we see no harm in mixing them as suggested. As to the possibility of compressing 8 ins. of broken stone to 6 ins., the usual assumption is that 9 ins. of loose stone can be compressed to 6 ins. in the finished road, but it is advised that only about 4½ ins. in thickness be compressed in one layer.

ANNUAL CONVENTION OF THE AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.

It seems but a few years since this society was organized, yet it held its fifteenth annual meeting last week. Attendance at these conventions has generally been rather small, owing to the somewhat limited membership of the society in the past, but the notable increase in membership attained during the past year promises larger conventions in the future. The attendance at Atlantic City, Oct. 20 to 23, appears to have been considerably under a hundred. This, however, did not prevent a good meeting, thanks to the unusually well selected and varied program.

After the usual preliminaries, the convention opened on Tuesday afternoon, with the address of Mr. Geo. W. Tillson, of New York City, President of the Society.

THE PRESIDENT'S ADDRESS.—Half of the engineers of the country, Mr. Tillson said in his annual address, are engaged in municipal work. During the past ten years the engineering schools, he continued, have had difficulty in supplying the demands of the cities.

There was a time when friendship between an engineer and a contractor was regarded as evidence of collusion. A good contractor, however, is the best asset of the engineer and there is no reason why the two should not work together.

While the engineer is supposed to deal chiefly with engineering, yet he has much to do with laws and ordinances. City laws should be permissive rather than restrictive. If you wish to make the engineer responsible you must give him authority, and at the same time hold him accountable. All through city government it is necessary to be able to put your hand on some individual who is responsible for the conduct of subordinates.

It is said that they do things better abroad. Perhaps they do. They have been at it longer. Paris existed five hundred years before it grew to the population of Rochester. We should study European city government because we can learn from its failures as well as from its successes. In conclusion, Mr. Tillson expressed the belief that some day New York City will have a model city charter which will give its executive officers authority and put the city in the front rank of municipal administration.

REPORTS OF SECRETARY AND TREASURER.—Mr. A. P. Folwell, Secretary, reported a large gain in membership during the past year, including members just elected. At the opening of the convention of a year ago there were 143 active and 53 associate members, or a total of 196. At the last meeting 16 members were elected. This raised the membership to 212, but during the year 21 resignations occurred and 32 names were dropped for non-payment of dues, leaving 159 members, of whom 125 were active and 34 associate. The addition of 107 members at the opening of the present convention (about 20 associates) raised the total membership to 266.

Mr. L. V. Christy, of Wilmington, Del., reported a treasury balance of $605, against $715 a year ago, but some hold-over bills had been paid during the year.

MUNICIPAL STATISTICS.—Mr. J. W. Howard, of New York City, as Chairman of the Committee on Municipal Data and Statistics, presented and commented on a compilation (from U. S. Census reports) of expenses and receipts of 148 of the largest cities of the country for the five years 1902-6. The largest per capita increase in expenses was for schools, some 25%. The increase in per capita receipts from taxes and licenses during the five years has been from $16.10 to $17.98.

Evidently too large a percentage of municipal outlays is met from loans and too little provision is made for depreciation. It also appears that fire department expenses might be reduced if more buildings of fireproof construction were only insisted on.

Mr. A. M. Heston, City Comptroller of Atlantic City, N. J., presented some ideas on municipal accounting and outlined the system carried out under his direction. He favored standardization of municipal financial reports rather than uniformity of bookkeeping, holding the latter to be impossible without uniform municipal charters. There was no discussion on either Mr. Howard's report or Mr. Heston's paper.

JOINT SEWERAGE DISTRICTS.—Some of the advantages of joint sewerage districts composed of a number of municipalities located in a single drainage area, as well as state legislation on the subject, a summary of existing and proposed districts and methods of distributing costs were presented by Mr. E. S. Rankin, Engineer in Charge of Sewers, Newark, N. J.

At least eleven states have passed laws authorizing joint sewerage districts. These are: Alabama, California, Illinois, Kansas, Massachusetts, New Jersey, New York, North Carolina, Ohio and Pennsylvania. The scope of the legislation in some of the states, however, is very limited. The most notable of the joint districts are the Massachusetts Metropolitan, the Chicago Sanitary, and those in New Jersey, which include (1) Elizabeth and six other municipalities discharging into Kill Von Kull, and (2) Orange and three other places discharging into the Passaic River. Proposed joint works in New Jersey include (1) the Passaic Valley District, which will take in Newark, Paterson, the Orange joint outlet just mentioned and various other cities and town; and (2) Plainfield and near-by places.

After reviewing methods of distributing the first cost of joint sewerage works, and stating that ratables or taxable valuations was the favorite basis, Mr. Rankin gave as his own conclusion that the best plan would be to distribute the cost of both construction and operation on the basis of volume of sewage contributed by the several municipalities. To illustrate the results under various methods Mr. Rankin took Newark, N. J., in its possible relations to the Passaic Valley scheme. If Newark paid in proportion to its present ratable valuation [as the law provides] it would contribute 52% of the whole estimated cost [$12,000,000]; on present population, 48%; estimated population in [illegible] 31%; area, 15%; estimated ratables in 1940 [illegible].

TIGHT JOINTS IN PIPE SEWERS. Benj. E. Briggs, City Engineer of Erie, Pa. [illegible] viewed his experience of many years in trying to get tight sewer joints, during which he [illegible] used methods suggested by the specifications of many different cities. He now uses a [illegible] large gasket, which he soaks over night in [illegible] to 1 cement grout. For a gasket he employs hemp packing, using one strand for 8-in. [illegible] two strands for 12-in. pipes. A good joint may be made with 1 part of coal tar and [illegible] parts of Portland cement.

REINFORCED-CONCRETE INTERCEPTING SEWER.—Mr. Alex. J. Taylor, Engineer-in-Charge of Sewers at Wilmington, Del., told how he had built 1,300 ft. of 30 and 36-in. reinforced-concrete sewer along Brandywine Creek. The pipe lengths were formed in 4-ft. lengths, the shell being 3½ to 4 ins. thick. The concrete was tamped in 2 or 3-in. layers. The forms were removed a day after they were filled but the pipe lengths were not lifted from their iron bed plates for four or five days and were stored two weeks before use.

MOSQUITO CONTROL.—Prof. John B. Smith, of New Brunswick, who is State Entomologist of New Jersey, gave a most interesting and practical lantern-slide talk on mosquito control. Incidentally, he showed how the usual window screen and window sash admit mosquitoes through the narrow unguarded spaces, horizontal in plan, left when the windows are opened. Attention was called to the enormous number of mosquitoes which breed in the water retained in dirt pails beneath perforated manhole covers and in catch basins. A slight amount of oil will prevent this, and in the case of properly trapped catch basins the oil will not be lost at every rainfall.

Already nearly 3,000,000 lin. ft. of ditches have been dug for draining the salt marshes of New Jersey, and by this means nearly all the breeding places from Secaucus to Tom's River have been eliminated. The evolution of drainage tools for this work, from ordinary ditching spades to 14-HP. gasoline-engine-driven machines, was interestingly outlined and illustrated by the speaker. The State of New Jersey owns six of these ditching machines (one has an oil instead of a gasoline engine), of which four are at work and two are in reserve. In both the hand and the machine ditching chunks of sod and clayey or other material the full width and depth of the ditch, or 10 × 30 ins., are removed. In some of the larger ditches a double cut is made, to give a width of 20 ins.

The spacing between ditches was soon increased from 30 to 50 ft., and later was made 200 ft. The sides of the ditches stand remarkably well. Cross ditches are avoided, to facilitate the use of the drained land. From some of this land 2 to 4 tons per acre of excellent salt marsh hay have been cut since draining. Mowing machines have been used and the hay drawn off at pleasure where formerly hand cutting, by men in hip boots, was necessary, and the hay could be removed only in winter.

COMMITTEE ON WATER SUPPLY.—Mr. J. L. Ludlow, Winston-Salem, N. C., reviewed water-works doings and tendencies of the past year. Larger and heavier pipes are being called for in some cities on account of the increase in the height of buildings. The question of municipal as against private ownership of water-works seems to have been settled for all time in favor of public ownership.

HOW TO OPERATE WATER AND SEWAGE PURIFICATION PLANTS.—When a man buys a good watch, horse or automobile, Mr. Geo. W. Fuller, of New York, stated in opening his paper, he expects to take care of it or else suffer the consequences of neglect. There has been a growing tendency of late to try to make water and sewage purification works fool proof, from which it may be inferred that engineers do not expect intelligent management of the works they design.

The interests of the public call for central supervision of purification works, but this should be chiefly as to results, leaving the details to

local authorities. Consumers need to be educated as to what to demand from water purification plants.

For large plants, a mechanician and an analyst will be required to give satisfactory operating results, and it is possible to employ both. In the smaller plants a difficulty is experienced in the matter of superintendence. There is an opportunity here for technical graduates who have served an apprenticeship with larger works.

Mr. A. P. Folwell, of New York City, remarked on questions incident to the division of responsibility for purity of public water supplies between sewage and water purification plants. It is a question how far State Boards of Health should go in requiring all towns to purify their sewers.

Mr. A. F. Eggers, of Newark, N. J., said that his city had acquired 10,000 acres of its water supply drainage area, had secured legislative authority to expend $1,000,000 more for this purpose, and has planted a large number of forest seedlings on its land.

COMMITTEE ON REVIEW.—Mr. C. D. Pollock, of Brooklyn, N. Y., chairman of this committee, said that in view of the fact that in previous years this committee had sent out 200 inquiries for information on which to base its report and had received only 8 replies, he had concluded that this year he would depend on the technical journals for his subject material. He then outlined briefly, in classified form, some of the notable municipal works recently completed or now in progress.

SEWAGE PURIFICATION VS. WATER PURIFICATION.—Rational ideas on the proper division of responsibility for pure water, as between sewerage and water departments, were presented in a forcible manner by Mr. Geo. C. Whipple, of New York City.

In most cases reliance should be placed on water rather than on sewage purification to guard against the dangers of sewage pollution, since by this means the amount of polluting matter to be dealt with is greatly lessened. Double filtration of water may be resorted to. Sometimes sewage purification may be employed in addition, particularly where the volume of sewage is small as compared with the volume of water.

New York State, through its Department of Health, exercises control over sewage disposal, often requiring purification works, but it attempts no control over water supplies.

The Royal Commission on Sewage Disposal [Great Britain], in its recent report [Eng. News, Oct. 8, 1908] has placed the seal of approval on some modern methods of sewage treatment and at the same time pointed out some of the weaknesses of those methods. It is a notable fact that the commission regards sewage disposal as a means of preventing a nuisance and not as a matter of protecting public water supplies.

Septic tanks and filter beds cannot be relied upon, in any event, to so purify sewage as to protect water supplies.

Finally, the question as to who should bear the financial burdens of sewage disposal, is a question which jurists should settle as soon as possible.

PARKS AND SHADE TREES.—A brief report by Mr. James Owen, of Newark, N. J., Chairman of the Committee on Park Development and Maintenance, served to introduce Mr. A. M. Reynolds, Jr., of Newark, Engineer of the Essex County Park Commission. Mr. Reynolds reviewed the work of the commission since its organization, a dozen years or so ago. When the commission was organized, there were but 130 acres of parks in the whole of Essex County, which includes the city of Newark and many residence suburbs of New York City. The park acreage now under the jurisdiction of the commission includes nearly 3,600 acres, in nine portions ranging from a small city park of 10 acres to a mountainous country reservation of 2,500 acres. The outlay for land and improvements has been about $5,000,000; playgrounds have been provided in all the parks, and in the South Mountain Reservation 150 acres has been enclosed as a game preserve and stocked with deer, pheasants and hares. Thousands of dollars have been spent in mosquito-extermination work where needed.

Another paper presented under the auspices of the Park Committee described the system of providing and caring for shade trees in East Orange, N. J. This paper was presented by Mr. William Solotaroff, Secretary of the Shade Tree Commission. About a dozen cities in New Jersey now have shade-tree commissions similar to the one in East Orange. These commissions are formed under permissive State legislation, and somewhat similar legislation, it appears, was enacted in Pennsylvania in 1907. The East Orange commission plants trees, provides them with guards, and stakes them where necessary, assessing the cost on abutting property owners. The cost is added to the yearly tax bills. The expenses of pruning, spraying, etc., are met in a general tax levy. Only one species of tree is planted on a given street. This paper was accompanied by many lantern slides showing how trees should be cared for, and also showing the advantages and disadvantages of different species of street shade-trees and different methods of pruning them. A particularly undesirable species of tree for street purposes is Carolina poplar [often planted because of its rapid growth]. The large roots of this tree lift flagstones or break the concrete of concrete sidewalks, and both the flowers and fruit of the tree are objectionable on account of their litter. The soft maple [another relatively fast grower] is objectionable on account of its tendency to have branches split and break off, particularly when loaded with snow.

The advantages of having street shade-trees under public control instead of the control of property owners is well illustrated by the streets and avenues of Washington, D. C., where the trees have been publicly controlled for the past 25 years.

The first cost of tree planting is relatively small. In East Orange the combined cost of macadamizing a 30-ft. roadway and providing a curb and a 4-ft. sidewalk is $3.85 per running foot. Trees 40 ft. c. to c. cost only 2 to 3% of this sum, including guards and stakes.

PAVEMENTS AND ROADS.—One of the notable features of the American Society of Municipal Improvements has been the careful and detailed attention which it has given to pavements and roads, particularly the former. This subject received a large amount of attention at the convention last week. A hearing was given at this convention to representatives of a number of relatively new companies engaged in pavement and road construction. The first of these representatives was Mr. William B. Spencer, of New York City, Vice-President of the Imperial Roads Co. Mr. Spencer stated that the roads made by his company are composed of asphalt and asphaltic oil, scientifically mixed with dirt. He claimed for these roads that they are waterproof, dustless, noiseless, smooth yet not giving rise to skidding of automobiles, and that they are also resilient. This company first thoroughly pulverizes the subgrade of the road, then applies the asphaltic material, then repulverizes to work the material in, and adds more of the asphaltic material. Plows and disk harrows are used in this work. When the aggregate has been thus prepared, it is tamped with a 3-ton roller, composed of ten disks armed with teeth and provided with bars for scraping off any material that may stick to the teeth. The roadway is finished with an ordinary macadam roller, then sprinkled with asphaltic oil, and finally a light layer of screenings is applied.

This sort of construction was first used in Kansas City five years ago. Its cost is about the same as for dustless macadam, but it is claimed that its life is two to four times longer than that of macadam. American asphalt and asphaltic oils are used. In answer to questions the author stated that neither the system of construction nor the tamper were in any way related to the petrolithic roads and tamper used in California.

Mr. James Owen said that a section of this road had been put down in Harrison, N. J., near Newark, but as the road had just been finished no results could be reported as yet. Mr. McClure, of Berkeley, Cal., stated that he was struck with the similarity of the Imperial and petrolithic road systems. In Monrovia, Cal., there are 20 miles of petrolithic roads, some of which are the finest of any roads he has ever seen.

HOW TO CONSTRUCT BRICK PAVEMENTS.—A unique instance of the intelligent and effective activity of manufacturers to see that their product is properly made ready for use after it leaves their hands, has been afforded for many years past by the National Paving Brick Manufacturers' Association. Mr. Will P. Blair, of Indianapolis, Ind., secretary of this association, presented a paper based largely on that portion of the brick-pavement specifications got up by the association which deals with the laying of the pavements.

After stating that the subgrade and concrete foundation for brick pavement does not differ essentially from that for other pavements, Mr. Blair took up the sand cushion. This must be 2 ins. thick. Expansion should be provided for at the curbs, but no transverse expansion joints should be allowed. The bricks should be delivered to the paver, preferably end up, on a board or on a gravity carrier, and no tamping should be allowed. The edges of the bricks should never be allowed to touch.

More errors are made in filling the joints of brick pavements than in any other part of the work. Nothing but cement filler should be allowed. Before it is applied, the brick should be wet down with a fine spray of water. The filler should be of Portland cement, 1:1 in the first course and 2:1 in the last course. After making sure that the sand is thoroughly dry, sand and cement should be mixed dry and thoroughly before water is added. The author described the special mixing-box designed to insure a good grout. This box should be kept close to the joints being filled.

Municipal engineers are not to blame for noncompliance with their paving requirements. The execution of methods laid down by engineers is almost always left to the contractors' foremen. The principal reason why good work cannot be secured is that for political reasons inspectors are employed who are fit for nothing else. Engineers should be permitted to choose their superintendents and inspectors. This applies to all municipal contract work, so that every energy should be directed to the elimination of this baneful factor in municipal work.

President Tillson and a number of other members of the association heartily commended Mr. Blair's paper. Considerable discussion followed, as to the need for transverse joints in brick pavements, trouble from rumbling, etc. Mr. Blair was strongly of the opinion that a general investigation of pavements showing defects which might at first thought be attributed to lack of transverse joints, would show that improper construction or some other particular was the real cause of the difficulty.

Concrete pavement of the Blome type (see Eng. News, Aug. 20, 1908) was the subject of a paper by Mr. H. S. Dewey, of the Rudolph S. Blome Co., of New York City. This was described as a granitoid block pavement, designed to stand heavy traffic, washable, non-slippery, and made feasible in point of cost by recent improvement and cheaper methods of cement manufacture. Expansion joints are used. The author stated that the use of rubber tires for vehicles and rubber-padded shoes for horses provides the resilience once deemed necessary in the pavement itself.

Mr. J. W. Howard, of New York City, asked some questions regarding the novel features of and the patent claims on this pavement. The author stated that the chief claims were the grooving, the elimination of dust from the stone used in the concrete, and the sizes of the stone employed. The dust is removed by screening and blowing. The objections to continuous longitudinal joints are obviated by breaking these.

Mr. L. L. Tribus, of Richmond Borough, New

York City, stated that in that borough they had made various experiments with pavements. One of these was based on the idea that the binder course of ordinary asphalt pavement might be rolled and made to serve as finished surface. On finding that the voids were not well filled, the mixture was changed accordingly. Such a pavement can be laid under New York conditions, which include an eight-hour day, for $1.25 to $2 per sq. yd., or perhaps $1.65 as an average. It is called bituminous concrete and is laid on a macadam foundation, or, where traffic is heavier, on concrete.

Still another style of concrete pavement was described by Mr. Claude A. McGill, of New Haven, Conn., Manager of the Connecticut Hassam Paving Co. The speaker urged that bituminous binders are not permanent, and that Portland cement has proved itself to be the best binder for broken stone. Accordingly, the macadam system, with the Portland cement binder, has been adopted by his company. This binder is introduced by grouting the broken stone after the latter has been put in place and compacted by rolling. Formerly the stone was placed and rolled and grouted in three layers, but difficulty was experienced in getting the workmen to so conduct the work as to avoid setting of the cement between the layers. Now the 6 ins. of broken stone are placed in layers and rolled without intermediate grouting. After the grouting of the whole mass at one operation, the roller is again put on. A tandem steam roller is employed.

Stone passing a 2½-in. mesh and retained on a 1-in. mesh, is used. The grout is one part Portland cement and two parts sand, with water added to bring it to the consistency of cream.

Transverse joints were at first used, but having been found objectionable they are no longer employed. Where used, the concrete broke off at the edges, and at times the expansion material was forced up onto the concrete.

This kind of pavement was said to be suitable for State highways as well as town and city roads. It was also said that concrete so made is used for a foundation for brick and other pavements. The Hassam pavement is now in use in eight or ten states, chiefly in the Northeast and the Far West, and also in Canada. It was employed on the motor parkway on Long Island, of which nine miles has been constructed. Here the pavement is 5 ins. in thickness and has a woven wire reinforcement near the bottom. The only special appliances required for this work, over those used in ordinary road work, are the Hassam grout mixer and the tandem steam roller. The grout is piped to place.

In answer to questions as to the setting of the cement before rolling was completed, Mr. McGill said that no difficulty was now experienced in this particular. A slow-setting cement is used, and no material set results inside of the three-quarters of an hour or so needed for rolling. The surface finish, the author of the paper said in reply to a question, is something like asphalt, only rougher. Some surplus cement comes to the surface and gives rise to ridges at first, but these wear off after a little.

MAINTENANCE AND REPAIR.—The cost of maintaining asphalt pavement, Mr. G. H. Lutz, of Kansas City, Mo., said at the outset of his paper, is the chief objection which has ever been urged against it. In Kansas City, for instance, the maintenance charge within the past few years has rapidly mounted up until it has reached $200,000 a year. The author then described the Lutz surface heater, for use in repairing asphalt pavements. Instead of using the flame direct on the asphalt, which the author stated often injures the material, he employs a large blast of hot air, the air being heated by oil. The hood is 10 ft. wide transversely of the street and 5 ft. in the other direction. Spoiled material is cut out and new material added immediately, while the old surface is still hot, without painting or other treatment. Old material is removed and new material added to a depth of anywhere from ¼ to ½-in. to 2 or 3 ins., according to local needs. The light depths named are for skin patches, for resurfacing wavy places.

By the use of this machine and method, the author stated, repairs may be made at as low a figure as 18 cts. per sq. yd. where very little material is required. Kansas City contractors have taken repair work at 87½ cts. per sq. yd., and paid royalties in addition for the use of the machine. Old prices sometimes ran to $1.50 and even $2. The machine has been satisfactorily used in repairing petrolithic and other kinds of bituminous pavements. With it, granite or brick can be heated without cracking, then painted or mopped with tar, and an asphaltic or other material added to form a new surface.

Mr. Lutz also described a new mixing plant, devised by himself in conjunction with Mr. Blake. One of the chief features of this plant is the use of a hot-air blast for melting the asphalt. A large drum, quite like a Ransome concrete mixer, is employed for heating and mixing. Chunks of asphalt about as large as a man's fist are admitted to the drum through the hopper.

MINERAL RUBBER ASPHALT MACADAM.—Mr. Lynn White, Engineer of the South Park Commissioners of Chicago, Ill., sent a paper which was read in part, describing an asphalt concrete wearing surface which may be laid on a base of cement concrete, macadam, bonded gravel, bituminous composition, or other stable material. In cost this stands between macadam and expensive pavements. The name "mineral rubber" has been chosen simply because it seems descriptive. The pavement has been developed in Chicago, where the first block was laid on Michigan Ave. in May, 1908. Other sections have been laid since, and some has been put down in two other cities of the Central West.

CITY GOVERNMENT AND LEGISLATION.—Mr. Horace Andrews, Albany, N. Y., Chairman of the Committee on City Government and Legislation, read a report which consisted chiefly of a review of recent municipal legislation in New York State, which has been so voluminous as to be appalling. This was followed by some remarks on the relative desirability of having municipal engineering works carried out under the charge of a centralized board of public works, as compared with separate commissions. The committee was of the opinion that centralization was best. The fact that on many of the special commissions in New York City it has been found possible to get able, public-spirited men to serve, was put forth as a basis for the conclusion that good men could also be secured for a board of public works.

OTHER PAPERS AND REPORTS.—A few committee reports scheduled on the program did not materialize, and a few other reports and papers were read by title. Among the latter were: "History and Operation of the Des Moines Plan," by W. W. Wise, of Des Moines, Ia.; "A Modern American Public Service Franchise," by Charles Carroll Brown, Consulting Engineer, of Indianapolis, Ind.; and "A Municipal Franchise Is a Valuable Asset and Should Be Treated So by Those in Authority," by Isaac R. Breen, City Attorney, Watertown, N. Y.

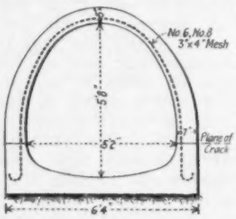
OFFICERS AND NEXT MEETING PLACE.—Mr. James Owen, of Newark, N. J., was elected President; Mr. A. P. Folwell, Editor-in-Chief of the "Municipal Journal and Engineer," 239 West 39th St., New York City, was reelected as Secretary; and Mr. E. S. Rankin, of Newark, N. J., was elected as Treasurer. Little Rock, Ark., was chosen as the place for the next meeting.

The committee on a badge for members of the society submitted a design for a badge, which was adopted. The badge consists of a circle enclosing a four-pointed star, with the letters A. S. M. I., one on each point.

THE CHARLES RIVER SHUT-OFF DAM between Cambridge and Boston was successfully closed at 11 a. m., Oct. 20, in the presence of the Governor of Massachusetts and Council, the Mayors of Boston, Cambridge and Somerville, the Charles River Basin Commission and many prominent engineers. This dam is a temporary timber and earth structure erected above the site of the permanent dam and roadway of the Charles River Basin to enable the permanent work to be completed. This work has been described by articles in Engineering News of Oct. 6, 1904, Jan. 12, 1905, and March 1, 1906.

FAILURE OF A REINFORCED-CONCRETE PRESSURE CONDUIT.

A reinforced-concrete conduit recently completed as part of the new water-works system of Richmond, Va., has shown many cracking under a test pressure of 9 lbs. per sq. in. The conduit, about 5,000 ft. long, is intended to carry the water-supply of the city, under a pressure of 10 lbs. per sq. in., from the sedimentation and coagulation beds, about five miles from the city, to the main pumping station. It is located along the shore of the James River and is at all times partly submerged and in flood seasons entirely under water, besides being covered with a rip-rapped dirt fill. This partially submerged condition led to the adoption of the concrete instead of the more costly cast-iron or of steel or wood-stave, which would rapidly deteriorate under the alternate wetting and drying. As constructed, the conduit is egg-shaped, 5 ft. 8 ins. high and 5 ft. 2 ins. wide, with sides varying from 7 ins. in thickness at the bottom to 5 ins. at the top and reinforced on a circumferential line 2 ins. from the interior with 4 x 8-in. Nos. 6 and 8 wire mesh. (See diagrammatic sketch in accompanying figure.) In the construction the invert was built about 100 ft. ahead of the arch, rough joints and projecting wire being left to ensure a tight joint.



The cracks, which occurred under a test pressure of 1 lb. per sq. in. less than the designed working pressure, are in nearly every case in a horizontal line along the joint between the invert and the arch sides. Although the two opposing pieces at the cracks are in line, it is evident that the breaks were caused by the upper portion pushing outward at the joint; after the pressure was released the two parts settled back into their original place. In one place the outward movement of this lower wall of the arch caused the crown of the arch to break under the resulting flexural action, but it seems certain that this was purely a secondary movement.

A thorough investigation into the collapse is now being carried on, and until this report is made no exact statement can be made, particularly as the conditions of water and dirt level preclude the possibility of local examination. However, certain conditions that help to explain the cracks have been brought to light by the examinations of the city engineer's office. The contributory causes so far ascertained are poor concrete and inadequate bonding. The concrete specified was a 1:3:4 Portland cement, sand and crushed granite mixture. These materials were used and were of good quality, but from an examination of the concrete surrounding the cracks it seems that the mixture was not as rich as specified and that the mixture was poorly made, so that a very porous material resulted. The bonding at the joint was weak both from improper joining of the reinforcing and from inadequate tamping. The wire mesh in the arch, which ought to have been tied to that in the invert at every wire (every 4 ins.) was really joined only every 18 ins. This, of course, made the entire joint dependent upon the concrete, which although roughened for just this purpose did not form a tight joint, largely on account of the extension of the side forms to such a height as to prevent effective tamping in the side walls. As designed, the conduit should have been amply strong to withstand the comparatively low pressure of 10 lbs. per sq. in. The entire fault seems to have been in the construction. As the concrete was about 30 days old when tested, it surely had reached an effective set.

The contractor is the Crouch Construction Co. of Perth Amboy, N. J. The City Engineer is Mr. Charles E. Bolling.

A NEW SCRAPER EXCAVATOR.

The use of scraper buckets handled by derrick cars is a comparatively recent method of excavation which has been adopted with success for various classes of work. This method of work was described in our issue of March 21, 1907, with descriptions of some of the scraper excavators then in use.

In most of these machines, the bucket has a swivel bail to which the hauling cable is attached. With this arrangement, however, there is sometimes difficulty in regulating the depth of cut, and the bucket may ride over hard material instead of cutting into it.

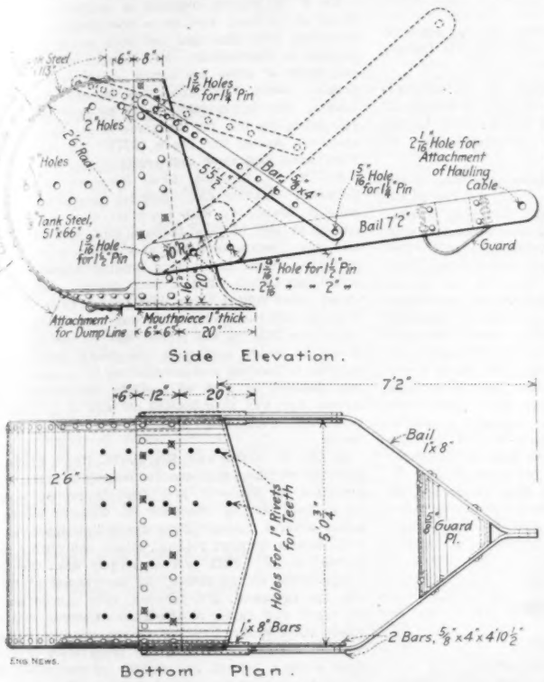


FIG. 1. A NEW DESIGN OF BUCKET FOR SCRAPER EXCAVATORS.

(James O. Heyworth, Chicago, Builder.)

A special form of bucket, which is designed to overcome this difficulty, has been invented. This is shown in Fig. 1, the dimensions given being those for a bucket of 2½-yds. capacity. In this bucket there is a rigid attachment of the bucket to the bail, thus ensuring a positive depth of cut. The attachment is adjustable, so that the depth of cut can be varied to suit the character of the material. The bail is attached to pairs of side bars pivoted to the lower end of the mouth. To the upper end of the bucket are attached two side bars which are attached also to the bail, and thus maintain a fixed relation of the bucket to the bail. These side bars have 1 5/16-in. holes for the 1¼-in. pins by which they are attached to the bucket and the bail. The dotted lines show the limit of adjustment. For excavating hard material, steel teeth may be fitted to the cutting edge, rivet holes being provided for this purpose.

The bucket is the invention of Mr. W. J. Newman, and the excavating machine equipped with this bucket is being put on the market (under the name of the Heyworth-Newman excavator) by James O. Heyworth, Harvester Building, Chicago.

Fig. 2 shows a Heyworth-Newman excavator in use on the Evanston channel of the Chicago Drainage Canal. The machine is a large revolving derrick car, of steel construction, traveling on lines of wooden rollers laid under the sills. The turntable is 25 ft. diameter, and carries a frame on which are mounted the 85-ft. box lattice boom, the 35-ft. steel mast, and the operating machinery. The mast is guyed from both ends of the frame. A topping lift provides for varying the reach and height of the bucket. The maximum width of cut is 75 ft.

The bucket is of 3⅓-cu. yds. capacity. It has two operating lines: (1) the hauling line, attached to the point of the bail and led direct to the engine drum; (2) the hoisting line, led over the boom to a block which is attached to the bucket by a chain sling. One end of the hoist line is carried from a block over a sheave to the rear of the bucket to dump it. The view shows the loaded bucket in position for dumping, which is effected by hauling in the dump line so as to tilt or invert the bucket.

The machine is owned and operated by Mr. James O. Heyworth, of Chicago, who has a contract for two miles of the channel, with about 880,000 cu. yds. of excavation. It has been working on the east side of the channel since Sept. 1, and another will soon be installed on the west side. The present machine is said to average 1,800 cu. yds. per day, and has to swing through 180° to the waste bank. The machine is operated by two men, an engineman and a fireman; these work in three shifts. There are also three laborers (working two shifts); these men attend to grading the path of the machine and moving the rollers upon which it travels.

The material is mainly a stiff clay; it is soft in places, while in others it is practically hardpan. The average depth of cut is 28 ft. The channel has a bottom width of 30 ft., with side slopes of 3 on 5. The material is being dumped in a spoil bank along the line of the work, a 25-ft. berme being left along the top of the cut.

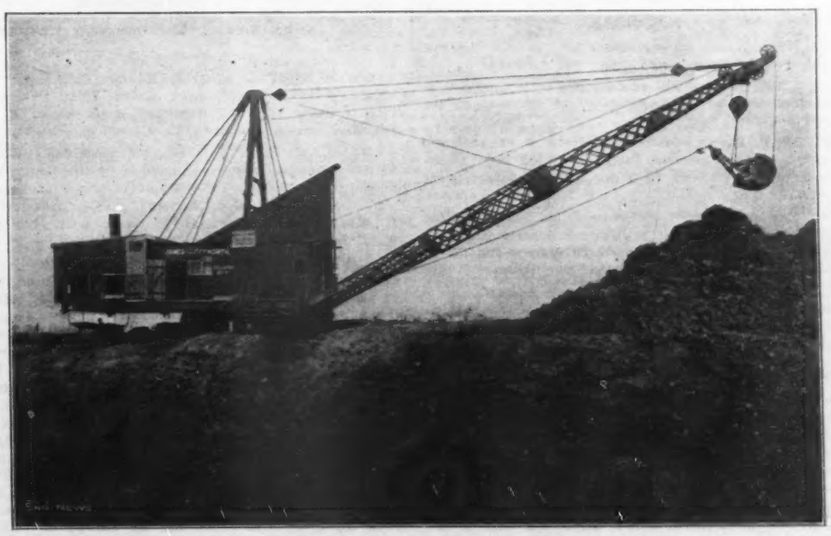


FIG. 2. A HEYWORTH-NEWMAN SCRAPER EXCAVATOR AT WORK ON THE EVANSTON CHANNEL OF THE CHICAGO DRAINAGE CANAL.

A CLOUDBURST AND TORNADO killed four persons and injured 20 others near Clayton, N. Mex., Oct. 19. The Union County court-house, recently erected at a cost of $40,000, was wrecked by the storm and several houses were torn from their foundations.

A FLOOD IN NORTHERN LUZON, P. I., Oct. 12, resulted from the heavy rains accompanying the typhoon of that date. The level of the flooded rivers was raised in some cases 30 ft. Hundreds of houses and animals were carried away by the flood, and it is estimated that 300 natives lost their lives.

A ROUNDHOUSE ROOF collapsed on Oct. 20. The roundhouse is that of the Lehigh Valley R. R., at Wilkes-Barre, Pa. Repairs were going on, it appears, but the building was still in regular use, so that several locomotives were caught under the wreckage. One of the roof workers was killed.

A CAR WAS BLOWN FROM THE TRACK of the Union Pacific Ry. near Lone Tree Creek, Wyo., 30 mi. west of Cheyenne, by the gale of Oct. 19. It was the caboose of a work train bound for Hermosa Junction and carried about 40 laborers. The wind threw the car from the rails, breaking its coupling, and it dropped 30 ft. down the embankment. The car was entirely broken up and six men were killed.

A COLLISION AT STICKNEY, N. B., on the Canadian Pacific Ry., Oct. 17, resulted in the death of two men. The accident is attributed to a heavy fog and wet rails. One of the trains, both of which were extras, was waiting on the main track for the second train, which was to take the siding at that point. The brakes of the second train failed to stop it in time to prevent the collision.

A FIRE BROKE OUT IN A COAL MINE, known as the Washington No. 1, at Star Junction, Pa., Oct. 18. The mine is owned by the Washington Coal & Coke Co. The fire started near the bottom of the shaft and is ascribed to the short circuiting of poorly insulated wires. The fans were stopped because of the rapid spread of the fire due to their draft, but the resulting accumulation of smoke and gas drove out the fire-fighters. Brattice work was then constructed at the rear of the fire and six men equipped with safety hoods attempted to check the flames. The extinguishment of the fire has not yet been reported.

THE BURSTING OF THE STEAM PIPE on the steam barge "Maggie Marshall," on Lake Michigan, Oct. 20, caused the death of four men who were in the engine room. The steam valve is said to have fallen with the broken pipe in such a way as to block the trap door which afforded the only means of escape, so that the men were imprisoned and those outside could not go to their help.

THE HUDSON RIVER STEAMER "NEW YORK," of the Albany Day Line, was burned to the water line while lying beside a pier at Marvel's ship yard, Newburg, N. Y., on the morning of Oct. 21. Four negro waiters, who were on board the vessel, were burned to death in their sleeping quarters below the deck.

The boat had made her last run for the season on the previous day and had gone to the shipyard to be overhauled and laid up for the winter. Fifty men of the crew were sleeping on board of the boat, having not yet been paid off and discharged. Steam was off the main boilers and the electric lights were not in operation. Fire broke out from an unknown cause in the quarters occupied by the colored waiters aft. There was a night watchman on board, but he did not discover the fire until called to it by another employee. Attempts to extinguish the fire with pails of water were unsuccessful. There was no power for the pumps and only one hand pump was manned. The local fire department was hampered by the distance from the pier, and the necessity of coupling hose from different fire companies, so that water was not turned on till 20 minutes after the alarm sounded. Notwithstanding the fact that the flames were confined to the vessel's hold at the time and did not burst through the main deck till some 20 minutes later, it was found impossible to cope with the fire, and it required the best efforts of the fire department to prevent the flames extending to the shipyard buildings and other vessels on the stocks. The "New York" was built in 1887 and had an iron hull. In 1898 she was cut in two and 30 ft. was added to her length.

THE PANAMA CANAL ESTIMATES for the fiscal year ending June 30, 1910, call for an appropriation of $35,000,000.

THE GEORGIAN BAY CANAL will be undertaken by the Canadian Government as soon as the Transcontinental Ry. is completed, according to a statement made by Sir Wilfrid Laurier, the Canadian Premier, in a public address at Hull on Oct. 19.

PAY-AS-YOU-ENTER CARS on the line of the Chicago City Railway are reported to have reduced the number of fatal accidents by 16.2% and to have practically eliminated minor accidents in getting on and off cars.

ELECTRIC POWER is being purchased by the Chicago City Ry. Co. from the Commonwealth Edison Co. for the operation of street car lines. The basis of the price paid is $15 per kilowatt per annum of total capacity plus 0.4 ct. per KW.-hr. of current used.

ELECTRIC TRACTION ON THE ILLINOIS CENTRAL R. R. in Chicago was approved by a meeting of the stockholders on Oct. 21. The stockholders adopted a resolution to the effect that "the board of directors should proceed with all reasonable dispatch to electrify the service within the corporate limits of the city of Chicago." On the same day the board of directors adopted the following resolution:

The demand on the part of the city and citizens of Chicago that the railways entering the city should take such steps to reduce to the lowest possible limit the annoyance caused by noise and smoke is a reasonable demand, and this company should and will give immediate attention to the attainment of that end.

PERSONALS.

Mr. Allen Wade, Superintendent of the City Water & Light Plant of Union City, Tenn., has resigned.

Mr. C. W. Everett will succeed Mr. J. S. Reddoch as Superintendent of the Aguascalientes division of the Mexican Central Ry.

Mr. C. P. Brown, Division Engineer of the Atlantic Division of the Canadian Pacific Ry., has been transferred to the Eastern Division, with headquarters at Montreal, Que.

Mr. Ray W. Reynold, of Lebanon, Ind., is to succeed Mr. Charles G. Lohman as General Superintendent of the Chicago, South Bend & Northern Indiana Ry. Co. at South Bend, Ind. Mr. Lohman has become Traffic Manager of the same line.

Mr. A. M. McGill, Master Mechanic of the Lehigh Valley R. R., at Wilkes-Barre, Pa., has been made General Inspector of motive power and rolling stock. Mr. D. D. Robertson, Master Mechanic at Sayre, Pa., will succeed Mr. McGill at Wilkes-Barre.

Mr. William J. Roberts, M. Am. Soc. C. E., Sanitary Engineer of the Washington State Board of Health, has resigned his position in the Civil Engineering Department of the State College at Pullman, Wash., to engage in water supply and irrigation engineering. His present address is Medford, Ore.

Mr. Charles Sutherland Hamner, M. Am. Soc. M. E., and Mr. Virginius Daniel Moody, Assoc. Am. Inst. E. E., have opened an engineering office at 25 Broad St., New York City, under the firm name of Hamner & Moody. Mr. Hamner graduated at Cornell University with the degree of M. E. in 1889. Mr. Moody is also a Cornell graduate, having taken the degree of M. E. in E. E. with the class of 1900.

Mr. L. H. Van Allen, formerly General Superintendent of the Western District of the New York Central & Hudson River R. R., is now in charge of the construction and operating departments of the Buffalo, Genesee & Rochester Ry., an electric line to be built between Buffalo and Rochester, N. Y. His headquarters are at Buffalo, N. Y. Mr. George A. Ricker, M. Am. Soc. C. E., Chief Engineer of the new line, is in charge of the location work, which is now nearing completion.

Obituary.

George Y. Robertson, Superintendent for 25 years of the Owego Water Co., died Oct. 17 at his home in Owego, N. Y. He was 68 years old.

James M. Rinard, Mill Superintendent of the Carnegie Steel Co. at the Edgar Thompson Works in Braddock, Pa., died Oct. 19 as the result of an accident at the works. Mr. Rinard was born in Johnstown, Pa., in 1867.

Ossian Guthrie, geologist and engineer, and one of the oldest settlers of Chicago, died Oct. 25 at the age of 82. He was born in Turin, N. Y., in 1826, and went to Chicago in 1846. A few years later he was connected with the pumping works at Bridgeport (Chicago) where his father installed pumps of the Dutch breast-wheel type for raising water from the Chicago River to the Illinois & Michigan canal. These were replaced by centrifugal pumps in 1884. Mr. Guthrie made a study of geology, especially in regard to the conditions around Chicago. He is said to have been one of the first to propose a connection of the Chicago River with the Des Plains River valley through a low point in the divide, for the purpose of diverting the sewage-laden Chicago River from flowing into Lake Michigan. In 1900, he suggested a system of controlling works near the mouth of the Chicago River for the purpose of regulating the flow to the drainage canal. This was described in our issue of Jan. 3, 1901. He became a member of the Western Society of Engineers in 1889. He leaves a widow but no children. He was a grandson of Dr. Samuel Guthrie, of Jefferson County, N. Y., who discovered the properties of chloroform in 1831.

ENGINEERING SOCIETIES.

COMING MEETINGS.

AMERICAN ELECTROCHEMICAL SOCIETY.
Oct. 30-31. Fall meeting at New York City. Secy., Dr. J. W. Richards, Bethlehem, Pa.

ROADMASTERS AND MAINTENANCE-OF-WAY ASSOCIATION OF AMERICA.
Nov. 10-12. Annual meeting at Milwaukee, Wis. Secy., W. E. Emery, West Chicago, Ill.

AMERICAN RAILWAY ASSOCIATION.
Nov. 18. Annual meeting at Chicago, Ill. Secy., W. F. Allen, 24 Park Pl., New York City.

SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS.
Nov. 19-20. Annual meeting at New York City. Secy., W. J. Baxter, 29 West 39th St., New York City.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS.
Nov. 30-Dec. 1. Annual meeting at New York City. Secy., W. H. Ross, 154 Nassau St., New York City.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.
Dec. 1-4. Annual meeting at New York City. Secy., Calvin W. Rice, 29 West 39th St., New York City.

AMERICAN INSTITUTE OF ARCHITECTS.
Dec. 15-17. Annual convention at Washington, D. C. Secy., Glenn Brown, "The Octagon," Washington, D. C.

THE MUNICIPAL ENGINEERS OF THE CITY OF NEW YORK.—At the meeting of Oct. 28 in New York City, a paper entitled "Municipal Water-Works of the Far East" was presented by Mr. George A. Johnson.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Nominations are announced by the Nominating Committee as follows: For President, Jesse M. Smith; for Vice-Presidents, Geo. M. Bond, R. C. Carpenter, F. M. Whyte; for Managers, H. L. Gantt, I. E. Moultrop, W. J. Sando; for Treasurer, Wm. H. Wiley.

OHIO VALLEY IMPROVEMENT ASSOCIATION.—The annual meeting was held at Louisville, Ky., on Oct. 22 and 23. The president, Mr. John L. Vance, urged the importance of securing action by Congress looking toward the prompt carrying out of the system of locks and dams recommended by the United States Engineers to maintain a minimum navigable depth of 9 ft. Mr. Joseph E. Ransdell, of the National Rivers and Harbors Congress, delivered an address on the importance of waterways as a means of transportation. Major W. L. Sibert, Engineer Corps, U. S. A., delivered an address, in the course of which he objected to the proposed reservoir system for conserving the flow of the Ohio River and its tributaries. Other addresses were made by Mr. W. K. Kavanaugh, President of the Lakes-to-the-Gulf Deep Waterway Association, and Mr. George W. Theiss, President of the Monongahela River Consolidated Coal & Coke Co. The latter stated that the loss to the coal traffic interests in consequence of the pr[illegible] of water in the river amounts to some [illegible] shipping property aggregating a value o[illegible] lying idle.

The officers elected are as follows: Pre[illegible] Vance, Columbus, Ohio; Secretary, J. F[illegible] Cincinnati, Ohio. The next meeting will be [illegible] nati, Ohio, in 1909.

WESTERN SOCIETY OF ENGINEERS.—[illegible] meeting held in the Society's rooms at Chicago on [illegible] per on "Macadam Road Construction" wa[illegible] A. N. Johnson, State Highway Engineer o[illegible] paper will appear in our next issue.

Mr. F. M. Button enquired as to the bes[illegible] stone to be used, and as to the method [illegible] macadam road that has not been rolled a[illegible] pockets or depressions. Mr. Johnson replie[illegible] ent kinds of stone are suited to different [illegible] traffic. Softer local stone may be used fo[illegible] course. The larger sizes should be used for [illegible] size being 3½ ins. for limestone or 2½ ins. for trap and granite. As to the repair work, the road should be filled level and then well rolled.

Mr. E. N. Layfield, Chief Engineer of the Chicago Terminal Transfer Ry., described some macadam paving done in connection with track elevation work. This included 12 ins. of blast-furnace slag, a covering of sand and clay (from a sand pit) as a binder, a course of 2-in. to 2½-in. stone, and a thin binding course of limestone screenings. Each of the four courses was thoroughly rolled, more rolling being done than if the work had been done by contract. The work was very economical, as a track was laid on the street, and all material delivered direct by 50-ton cars with side doors. This avoided the expense of hauling and distributing by wagons. The stone was dumped as high as possible, without blocking the tracks, and was then leveled off with a Jordan spreader car. All work was done by the railway company's forces.

Mr. M. G. Nixon and Mr. D. W. Roper discussed the qualities of different stones for macadam, especially those available in Illinois. Mr. Johnson replied, explaining as to the varying character of different stone of the same general class. Thus some limestones will bind well, almost without rolling; others can hardly be made to bind at all. This depends largely upon the chemical compositions of the stone. At the request of Mr. Loweth, the President, Mr. Johnson, gave a brief account of the work and duties of the State Highway Commission. These include the building of experimental sections of road in different localities, the preparation of plans for road bridges (which are mainly of concrete), the investigation of traffic conditions on roads, and the conduct of a general campaign of education as to the merits of good roads and the proper way of building roads which will be good, economical, and suited to the traffic conditions.

Mr. E. E. R. Tratman (Associate Editor of Engineering News), remarked that where hard stone is used for roads in England, the engineers aim at producing a mosaic appearance, with the individual stones exposed to view instead of concealed by mud or dust. This appearance is taken to indicate a good road. Furthermore, in some sections of that country the traffic is properly distributed over the road surface, while in this country it is usually concentrated at the middle of the road, teams turning out only to pass other teams. This causes undue wear of even the best roads. He instanced a style of macadam paving now under construction which differs essentially from that covered by Mr. Johnson's specifications: (1) the roadbed is rolled; (2) the coarse bed of stone is laid (but not rolled); (3) a bed of screenings is laid, sprinkled and rolled; (4) the road is opened to traffic as soon as it is dry, in order to let traffic work the screenings into the coarse stone; (5) after some weeks, another layer of screenings is spread, sprinkled and rolled, completing the work. The consolidation by traffic is ineffective, as the traffic is confined to the middle of the road, where the screenings are soon crushed to a fine dust that becomes a nuisance, while the sides of the road are left undisturbed.

On part of this work, gravel has been used as a binder, and was given a much heavier sprinkling than the screenings. These roads appear to be more compact and less dusty than where the screenings alone are used. Mr. Tratman called attention to the fact that lack of maintenance is the great cause of trouble with our country roads. He also pointed out that the specifications presented by Mr. Johnson provided only for screenings. Mr. Johnson replied, however, that the Commission has used gravel binder and recommends it as better than limestone screenings alone. Where roads are built with Joliet limestone, the Commission insists on the use of a fine gravel binder.

Mr. Loweth (C., M. & St. P. Ry.) referred to brick paving on a country road near Cleveland. This road has a very heavy traffic of milk and market wagons going to the city every morning, the empty wagons returning in the afternoon and evening. Under these conditions the brick paving is both satisfactory and economical.

CONSTRUCTION NEWS

Supplement to ENGINEERING NEWS. New York, October 29, 1908.

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CONSTRUCTION NEWS.

PLANS AND SPECIFICATIONS ON FILE.

(* denotes that this work is advertised in Engineering News.)

The following plans (P.) and Specifications (S.) are on file and may be seen at the office of The Engineering News Publishing Co., 220 Broadway, New York.

Bids close.	Work.	Place.	See Issue.
10-30	Pipe,	Passaic, N. J.	(S.)10-17
10-30	*Dredging,	Tuckerton, N. J.	(S.)10- 8
11- 5	*Bridge,	Austin, Tex.	(P. & S.) 10-15
11-14	Coal-handling plant,	Charleston, S. C.	(S.)10-15
11-14	Dredging,	Galveston, Tex.	(S.) 10-15
11-16	*Sewers,	Hartwell, Ohio.	(S.)10-22
11-17	*Lock and dam,	Mobile, Ala.	(P. & S.) 9-17
11-21	Alterations of bldgs.,	Philadelphia, Pa.	(S.)10-22
11-21	Water mains,	Pensacola, Fla.	(S.) 10-29
11-30	Aqueduct,	Los Angeles, Cal.	(S.)10-22
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10-30 Light, power systems, New York, N. Y.....10-29
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11- 2 Elec. machinery, Sherman, Tex..10-29
11-10 Elec. light plant, St. Marys, Kan.10-29
11-18 Transformer station, etc., Plattsburg, N. Y.....10-29
11-21 Alterations, 'phone system,etc., Philadelphia, Pa.....10-29
11-23 Sale, gas plant, Newburn, N. C.10-29

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10-31 Bridges, Bryan, Ohio.....10-29
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11- 2 Bridge, Elgin, N. B.....10-29
11- 2 Bridge, Alma, N. B.....10-29
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11- 2 Bridge, Vesta, Wash.....10-29
11- 2 Bridge, Salem, Ind.....10-29
11- 2 Bridge, Raleigh, Miss.....10-29
11- 2 Culvert, Lincoln, Neb.....10-22
11- 2 Abutment, Philo, Ohio 10-22
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11- 3 Bridge, Pensacola, Fla.....10-29
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11- 4 Bridges, Princeton, Ind.....10-29
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11- 6 Bridge, Tipton, Ind.....10-29
11- 7 Bridges, Frankfort, Ind.....10- 8
11-10 Substructure, etc., Fremont, Neb.10-29
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11-11 Bridge, etc., Cleveland, Ohio.....10-22
11-11 Bridge, Toledo, Ohio 10-22
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11-13 Bridge, Madisonville, Ohio.....10-29
11-18 Bridge, Marianna, Ark.....10-22
11-20*Bridge, Beaufort, N. C.....10-29
12- 7 Bridge, Grenada, Miss.....10-29
1-12 Bridge, Rensselaer, Ind.....10-29

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11- 9 Tower, St. Paul, Minn. 10- 8
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RAILWAYS.

BALLINGER & ABILENE.—Contracts will be let for building this railroad from Abilene to Winters, Tex. As noted on Feb. 20, 1908, this company was "chartered to build a line 53 miles long from Ballinger to Abilene, Tex. The officers are: C. A. Doose, Pres., Ballinger; John I. Guion, First Vice-Pres.; J. W. Powell, Second Vice-Pres.; Tom Ward, Third Vice-Pres.; J. McGregor, Secy.; Jo Wilmeth, Treas.; W. J. McDaniel, Ch. Engr. and Gen. Mgr.; C. O. Harris, Gen. Attorney. C. H. Willingham, W. J. Miller and W. E. Allen, of Ballinger; and Cicero Smith and R. K. Wylie, of Mineral Wells, are also among the incorporators." Noted on Jan. 2.

BESSEMER & LAKE ERIE.—Improvements are being made by the Bessemer & Lake Erie R. R. that will aggregate $1,000,000, according to the New York "Commercial." "The company hopes to have its entire line double-tracked from Pittsburg to Conneaut Harbor on Lake Erie by the time navigation opens, and this alone means that thousands of yards of concrete will be put in and several new bridges constructed. Filling and grading along the line has been going on for several months." H. T. Porter is Ch. Engr., Greenville, Pa.

CALIFORNIA COMPANY.—Incorporated in California with $2,500,000 capital stock, as a preliminary merger company to include the Bay Counties Railway, the Napa & Sacramento, and the Napa & Vaca Valley, and to build a main line from Richardson's Bay, Cal., northeasterly to Sacramento, about 90 miles. Branch lines are also proposed, it is stated, from Gallinas Creek north to Petaluma, 18 miles, and from the Stanley lands northward into Napa, five miles. Surveys are now being made for a route from Richardson's Bay to Tiburon, San Quentin, Point Pedro, Petaluma, and thence northeast to Sacramento. Charles W. Conlisk, Merchants' Exchange Bldg., San Francisco; R. A. Morton, C. H. Lind, L. N. Pryor, George James, Frank E. Cronice and Russell B. Field are the incorporators. The company eventually expects to build a line through Oregon to connect with the Northern Pacific. Announcement has been made that work will begin about Jan. 1.

CUYUNA RANGE.—This company has been incorporated in Minnesota by Cuyler Adams, of Deerwood, and H. B. Fryberger and H. C. Fulton, of Duluth. Company will build a line connecting Deerwood, Crow Wing County, east to Duluth and Superior, Wis. Capital, $100,000. The first annual meeting is fixed for June, 1909, and until that time Mr. Adams will act as Pres.; Mr. Fryberger, Vice-Pres., and Mr. Fulton, Secy. and Treas.

DAKOTA & WESTERN.—Grading has been completed on this proposed railway from Rapid City, S. Dak., southwest to Hill City, 20 miles; track has not yet been laid. The work is being done by the company's forces. A. M. Lamphere, Rapid City, is Ch. Engr. Incorporation of this company was noted on Oct. 22.

DENVER & RIO GRANDE.—The merger of all the lines of the Denver & Rio Grande R. R. Co. was made effective on Oct. 23 by its filing of a mortgage for $150,000,000. This mortgage secures a new issue of bonds. The sum of $90,000,000 will be used for refunding outstanding indebtedness, $25,000,000 to aid in the construction of the Western Pacific Railroad, now building from Salt Lake to the Pacific Coast, and the remainder for extension of old and construction of new lines.

FLAG RIVER.—Incorporated in Wisconsin to build from Superior, Wis., east via Portwing, Cornucopia and Herbster to Bayfield, 75 miles. B. C. Cooke is Pres. and Treas.; James Bardon, Vice-Pres., both of Superior; A. W. McLeod, of Washburn, Secy.

GRAND TRUNK PACIFIC.—Surveys are now being made for a line to run from a point on the main line southwest to Brandon, Man., and through that city following westerly through the wheat fields of Alberta and Saskatchewan.

Bids will be asked next month for an additional 200 miles of construction west of Wolfe River, Alta., and for a further 100 miles east of the termination of the present 100-mile contract east from Prince Rupert, B. C. The arrangements for the construction of the line through British Columbia are not yet completed, but plans, etc., are being considered by the British Columbia provincial government. It is announced that this railway from Winnipeg, Man., west to the eastern foot of the Rocky Mountains, will be 916 miles long, and from that place west to Prince Rupert, on the Pacific coast, 836 miles, a total of 1,752 miles. The first section was recently opened for operation from Winnipeg, west to Battle River, in Alberta, 686 miles, as noted on Oct. 1. From Battle River to the foot of the Rocky Mountains, 250 miles, construction work is far advanced. The line has been located from the eastern foot of the Rock Mountains to Prince Rupert, and work is now under way on the first 100 miles from Prince Rupert, eastward.

GREAT NORTHERN.—In the annual report of this company it is stated that in the construction of various short lines and branches there was expended $7,123,000. The sum of $8,109,000 was used in construction of lines in Canada and $12,643,100 was used toward building the Spokane, Portland & Seattle, which is owned jointly by the Great Northern and Northern Pacific. In addition $7,920,000 was spent in new equipment and $4,440,000 for other improvements and betterments.

HUDSON BAY RY.—Favorable reports of the agricultural conditions of a long stretch of country which the proposed new Hudson Bay Railway will open up for settlement have been brought to Ottawa by William McInnes, of the Geological Survey, who has just returned from a summer's exploration work in the territory tributary to the Churchill River. Mr. McInnes states that the clay belt suitable for cultivation runs much farther north from Saskatchewan River than has been generally thought, according to the Toronto "Globe." The Churchill, and not the Saskatchewan River, he finds is the northeasterly limit of land adapted for agricultural settlement. Fully noted on Aug. 20, under "Canada."

IDAHO & WASHINGTON NORTHERN.—Having succeeded in floating an issue of $2,500,000 bonds, the Newport-Metaline extension is assured. It will extend from Newport, Wash., the present terminus, to Metaline. The west bank of the Pend d'Oreille River has been chosen as the route for the extension. It will be 55 miles long. W. C. Smith, Spirit Lake, Idaho, is Ch. Engr.

ILLINOIS CENTRAL.—See under Electric Railways—"Chicago, Ill."

IOWA & OMAHA SHORT LINE.—Geo. W. Adams, Pres., Walnut, Iowa, advises us that preliminary work is nearly completed for this railway. Surveys have been made and right-of-way partly obtained. Company is now ready to receive bids on bond issue which will be guaranteed issue 5% semi-annual. This company, as noted on Sept. 17, was organized in Iowa with $1,000,000 capital. Company will build from Omaha, Neb., east to Des Moines, Iowa, 134 miles. The projected route is from Omaha east via Council Bluffs, Iowa; Treynor, Carson, Oakland, Walnut, Elkhorn, Exira, Panora and Dallas Center to Des Moines. G. W. Adams is Pres., Walnut; C. L. Kirkwood, Vice-Pres., North Branch; A. L. Ingram, Treas., and P. Kathmann, Secy., both at Treynor.

LAWTON, WICHITA FALLS & NORTHWESTERN.—The general grading contract for this railway from Randlett to Emerson, Okla., has been awarded to the J. E. KIRKES CONSTRUCTION CO., Oklahoma City, Okla., as noted on Oct. 1, under "Wichita Falls & Northwestern." This company is building a line from Red River Junction, Okla., where connection is to be made with the Wichita Falls & Northwestern, north via Randlett and Emerson to Lawton, Okla., 40 miles, passing through the large reservation opened by the government last year. Chas. Orth, Ch. Engr., Randlett, Okla.

MARIANNA, AUBREY & WESTERN.—Incorporated in Arkansas to build and operate

a line from Marianna, Ark., to Aubrey, in Lee County, nine miles. The incorporators are: J. T. Robinson, W. B. Snipes, H. F. Roleson, H. N. Pharr and E. J. Beasley, of Marianna; R. C. Wilkins, Little Rock; Max D. Miller and P. R. Turner, Marianna; W. S. Shackelford, Spring Creek.

MISSOURI.—See under Miscellaneous Contracts—Railway Dry-Dock.

MISSISSIPPI WESTERN.—Incorporated in Mississippi. Company proposes to build a railway from Meridian to Natchez, Miss., 175 miles. Capital, $2,000,000, with $1,500,000 of 5% bonds. The official list of the company is as follows: Pres., K. Threefoot, Meridian; Vice-Pres., J. W. Hudson, of Memphis, Tenn.; Secy.-Treas., J. A. Gibson, of Meridian; General Agent, W. A. Wall, of Raleigh, Miss.; Industrial Agent, William Cornell, of Lake, Miss.; Directors, C. T. Williamson, of Meridan; C. M. Witworth, Mendenhall; S. L. Ryan and J. A. Porter, Rose Hill, Miss.; P. L. McRae, W. T. Rogers and O. H. Haralson, Silverena, Miss.; W. M. Reed, Ridley, Miss.; J. M. Martin and J. B. Currie, Raleigh, Miss.; B. J. Hamrick, of Hickory, Miss., and A. H. Longino, Jackson, Miss. Noted on Sept. 10.

MONTANA, WYOMING & SOUTHERN.—This company has been granted a charter in Wyoming, with $5,000,000 capital, to build from Sheridan, Wyo., north to Miles City, Mont., 125 miles. An extension may eventually be built from the proposed southern terminus at Sheridan, south to the Colorado & Southern at Orin Junction, Wyo., 180 miles. R. H. Walsh, Pres. of the First National Bank, Sheridan, is Pres.

NEW ORLEANS GREAT NORTHERN.—Official announcement is made that construction will be resumed on the Mandeville and the Tylertown branches, and also on the main line. It is expected that the Mandeville branch will be finished and put in operation by Nov. 15, and the Tylertown branch by Dec. 25. This railroad will be built from New Orleans, La., to Jackson, Miss., 180 miles, with branches, making a total of about 300 miles. Now completed to Slidell, La., northward on main line into Mississippi 115 miles; Pearl River to Folsom, La., 37 miles; branch to Mandeville, La., 12 miles; branch, Slidell to Abita Springs, La., via Mandeville, 26 miles; branch via Franklinton to Tylerton, Miss., 41 miles. Trackage, New Orleans & Northeastern R. R., New Orleans to Slidell, La., 29 miles; total, 260 miles. Under construction, about 40 miles into Jackson, Miss. Noted on June 4. N. G. Pearsall, Gen. Mgr., Covington, La.

NIANGUA & WESTERN.—This company has been granted a charter in Missouri to build and operate a line from Bolivar, Polk County, Mo., east to Lebanon, Laclede County, about 60 miles. Capital stock, $600,000. The incorporators include: A. C. Lovan, L. O. Lovan, Jennie S. Lovan, Georgia Lovan, and J. M. Smith, all of Springfield, Mo.

QUITMAN & GREAT NORTHERN.—We are officially advised that the ST. LOUIS CONSTRUCTION CO., Commonwealth Trust Bldg., St. Louis, Mo., which has the general contract, will sublet the grading and track laying work on the first 25 miles of this projected line in Wood County, Tex. Bids wanted also for the necessary wooden bridges, clearing, grubbing, etc., and for cross ties and timber. Proposals for the work should be addressed to the St. Louis Construction Co., 412 Commonwealth Trust Bldg., St. Louis, Mo. The Quitman & Great Northern was organized to build from Mincola, Tex., north through Hopkins and Delta Counties to Paris, in Lamar County, about 85 miles. Noted officially on Aug. 27.

SANTA ROSA & CLEAR LAKE.—J. W. Barrows, Santa Rosa, Cal., is making preliminary survey for this railroad in Lake County.

SAVANNAH VALLEY.—Application has been made for a charter in Georgia to build from Garnett and Sylvania to Egypt, Ga., in Effingham County, about 35 miles. Capital, $250,000, of which $125,000 is in 5% bonds and the rest in stock, all subscribed and the money paid in. Contract has been let to J. W. WRIGHT, Jr., Millhaven, Ga. The directors are E. T. Comer, Pres., Millhaven, Ga.; J. H. Perkins, Vice-Pres., Hagan, Ga.; J. E. Foy, Gen. Mgr., Egypt, Ga.; H. R. Perkins, Secy., Augusta, Ga.; M. B. Lane, Savannah, Ga.; L. J. Kilpatrick, Millhaven, and W. J. Walker, Sylvania, Ga.

ELECTRIC RAILWAYS.

(* *denotes that this work is advertised in Engineering News.*)

BUFFALO, N. Y.—It is announced that the last link connecting Erie with Buffalo by trolley will be completed by Jan. 1, 1909, by the Buffalo & Lake Erie Traction Co. The only gap now remaining is at Westfield, and this will soon be closed under action taken by the village taxpayers, who have voted $35,000 toward the expense of a viaduct to connect the hills on the opposite sides of Chautauqua Creek. Noted on Sept. 3.

NEW YORK, N. Y.—The Public Service Commission on Oct. 20 received its first application for construction of a monorail line in this city. The application was made by the Monorail Construction Co., which, it was stated, has just completed the purchase from the Interborough Rapid Transit Co. of the Pelham Park & City Island Railroad Co. The new company has been organized with a capital stock of $1,500,000, and the promise was made that in not more than three months after the necessary permits have been granted the new system of transportation will be in operation. Among those interested in the project are C. C. Cuyler, Morgan & Co., 44 Pine St.; Robert H. McCarter, Attorney-General of New Jersey; Charles Stewart, formerly President of the Chamber of Commerce and member of the Rapid Transit Board; Samuel McMillan, Pres. of the Pelham Park & City Island Railroad; John H. Starin, for many years vice-president of the Rapid Transit Board and owner of the Starin Transportation lines; Charles F. Holm, of the Hudson Trust Co.; Henry W. Williams, of Baltimore, and Bion L. Burrows, formerly Secretary of the Rapid Transit Board. The officers of the company are: Bion L. Burrows, Pres.; Edward M. Shepard, Counsel; Harry B. Reed, Ch. Engr., and Howard Hansel Tunis, Consulting Engr. The monorail car which the company proposes to use is the invention of Mr. Tunis, of Hansel Hall, Baltimore.

LONG BRANCH, N. J.—The Atlantic Coast Electric R. R. Co., which operates a line connecting Long Branch, Asbury Park, Belmar, Spring Lake and Sea Girt, 31 miles, has been granted a 20-year franchise to run a line between Pleasure Bay and Monmouth Beach by way of Atlantic Ave. S. F. Hazelrigg is Pres., Gen. Mgr. and Pur. Agt., Asbury Park.

JEANNETTE, PA.—The address of A. W. SPERRY, who has contract for construction of the Jeannette, West Newton & Monongahela Valley St. Ry., as noted last week, is New Haven, Conn.

CHESTER, PA.—Joseph Shortledge, of Concordville, Pa., is promoting an electric railway to be built from Chester to Llewellyn, Concordville and West Chester.

WILMINGTON, DEL.—The Wilmington "Star" states that "although construction work on the projected West Chester & Wilmington Electric Ry. has been abandoned for three months because of a combination of reasons, Thomas E. O'Connell, Pres. of the company, says the road will be built." Mr. O'Connell's address is Oxford, Pa. The line when built will connect West Chester, Pa., and Wilmington.

WINSTON-SALEM, N. C.—Dr. H. P. MacKnight, proprietor of Vade Mecum Springs, plans to build a standard-gage electric railway from Winston-Salem to Stuart, Va., via Rural Hall, Capella Gap, Vade Mecum, Moore's Springs, Piedmont, Danbury and Sandy Ridge, N. C.; total length about 60 miles. "There will not be any company," according to the "Manufacturers' Record," "the proposition being under Dr. MacKnight's individual ownership and management. E. Hillman, formerly of East Brookfield, Mass., and recently of Aberdeen, N. C., is his assistant. Dr. MacKnight is doing his own engineering, and he says he has purchased the right-of-way, besides surveying and staking out the line. Some grading has been done as well as clearing. The estimated cost is $750,000, of which he proposes to furnish about $150,000, while the remainder will be in bonds at 5 per cent."

GREENVILLE, S. C.—Financial affairs have been arranged for commencing construction on the Greenville & Hendersonville Electric Ry. Headquarters for the construction forces will be at Greer, S. C. John P. Rowland, of Asheville, N. C., is the promoter of the company.

AUGUSTA, GA.—The Augusta & Edgefield Elec. Ry. Co. has awarded contract to REQUARTH & KELSEY, Charleston, S. C., for surveying its line between Augusta and Edgefield, S. C. Wm. P. Calhoun, of Edgefield, is Pres.

ATLANTA, GA.—The Railroad Commission has authorized the Atlanta Northeastern R. R. Co. to issue $1,200,000 of stocks and bonds for the purpose of constructing a line from Atlanta to Cumming, 42 miles. They will be first mortgage, 30-year 5 per cent. bonds. The plans for the new electric road for which a charter has been granted, contemplate a line from Atlanta to Cumming, through Roswell and Alpharetta. A roadbed of the most substantial character and equipment of the latest and most approved type are to be provided, according to the plans of the promoters. When the Atlanta-Cumming line is in operation, it is contemplated that extensions will be made to Dahlonega in Lumpkin County, another to Ellijay in Gilmer County, and another towards the east. Eventually a network of electric roads will cover these counties of north Georgia which now have not a mile of steam road within their borders. The following persons are interested in the new road: Hon. F. C. Tate, Jasper; C. C. Foster and J. O. Crowley, Roswell; W. A. Lummus, J. I. Teasdale and J. P. Brooke, Alpharetta, W. R. Atwell and C. I. Harris, of Cumming. Noted on July 16.

COVINGTON, LA.—It is planned to have the St. Tammany & New Orleans Ry. & Ferry Co.'s line in operation between Covington and Mandeville by Jan. 1, 1909. At Mandeville, it will connect with ferry for New Orleans. Officers are Clay Riggs, Pres.; C. Z. Williams, Covington, La., Vice-Pres.; John Birg, Franklin, La., Secy. and Treas., and Preston Herndon, Covington, Ch. Engr.

CHATTANOOGA, TENN.—The County Court has granted to D. J. Duncan a franchise for a trackless trolley line up Lookout Mountain and Walden's Ridge. Mr. Duncan is given one year in which to complete the line and place it in operation.

CANTON, OHIO.—John Monnett, of Canton, is promoting an electric railway between Canton and Youngstown. Construction may begin next spring.

ZANESVILLE, OHIO.—J. J. Breitinger, 1322 East 114th St., Cleveland, has announced that the proposition of an interurban line between Zanesville and Cleveland has been fully financed and that the work of construction will be commenced within the next two months. The new road will connect this city with Cleveland by way of Cochocton, Orville, Barberton and Elyria. The officers are J. J. Breitinger, Pres.; W. E. Brooks, Elyria, Vice-Pres.; J. H. Knisely, Secy., and W. E. Ottman, New York, Treas.

SAGINAW, MICH.—The Detroit, Flint & Saginaw Ry. Co. has filed for approval with the Railroad Commission a map of the extension of its system from Frankenmuth to Flint. The extension will run through Burton, Genesee, Mount Morris and Vienna Townships, Genesee County; and Birch Run, Frankenmuth and Bridgeport Townships, Saginaw County. The line now connects Saginaw and Frankenmuth, 14 miles. Chas. P. Anderson, Supt., Saginaw. Noted on July 23.

DOWAGIAC, MICH.—Articles of incorporation have been filed for the Dowagiac Railway Co., the incorporators being C. K. Minary, H. S. Grey and Henry C. Mason, of Benton Harbor, Mich. The capital stock is $200,000. The incorporators are identified with the Benton Harbor & St. Joseph Street Railway and Light Co., and it is their purpose to extend the electric line from Eau Claire to Dowagiac.

CHICAGO, ILL.—The Chicago & Proviso Ry. Co. has made application for a charter. The company, which proposes to construct a line in or near Division St., from the eastern boundary of River Forest, through Oak Park and Austin, and into the western part of the city, is the outcome of a citizens' movement which took shape several months ago in the western suburbs. The incorporators are F. D. Kilmer, J. M. Swanson, H. L. Fearing, M. A. Rawson, Secy. of the Calumet and Chicago Canal & Dock Co., and N. C. Fisher, Secy. of the Garden City Sand Co.

EAST ST. LOUIS, ILL.—The St. Louis & St. Libory Ry. Co. has been incorporated in Illinois to construct a line from East St. Louis through St. Clair County to St. Libory. Incorporators are: Edward L. Thomas, John T. Taylor, David O. Thomas, C. A. Heinzelman and Gustave A. Becker, all of Belleville, Ill.

CHICAGO, ILL.—Electrification of all the tracks of the Illinois Central Railroad Co. within the limits of the city of Chicago was authorized at the annual meeting of stockholders of this company on Oct. 21, and the change from steam to electricity, declares the resolution "must proceed with all reasonable dispatch." The Board of Directors of the road also passed a resolution, prior to the stockholders' meeting, asserting the desirability of all railroads entering the city doing all in their power to minimize the smoke nuisance.

JANESVILLE, WIS.—We are officially informed that the Cincinnati Construction Co. will not commence construction until next spring. Surveys for its proposed electric railways, which is to connect Janesville, Edgerton, Stoughton, Lake Kegonsa, Lake Waubesa and Madison, are not completed. Right-of-way is being secured. Capital has been obtained. The line will be 40 miles long. H. H. Zigler, Columbus, Ohio, is Pres., and Joseph Ellis, Janesville, Wis., Mgr. and Ch. Engr. Noted on Aug. 13.

MILWAUKEE, WIS.—The Milwaukee Light, Heat & Traction Co. has been authorized to build a branch line from Waterford, Wis., the present terminus of the Milwaukee-Southwestern division, southwest to Lake Geneva. John I. Beggs, Milwaukee, is Pres., Gen. Mgr. and Pur. Agt.

OMRO, WIS.—The Winnebago Traction Co. (now owned by the Wisconsin Elec. Co.) plans to build an extension from Omro southwest to Berlin, 13 miles. Sale of this company was noted on Aug. 13. R. T. Dunn, Gen. Mgr., Fond du Lac, Wis.

HEBER, ARK.—The City Council has granted a franchise to C. F. Crosby to build and operate a street railway system in Heber. Mr. Crosby was granted one year in which to begin work on the line.

W. H. Horton has been given franchise for an electric-light plant.

TEMPLE, TEX.—At a joint meeting recently of citizens of Temple, Waco and Marlin a resolution was adopted to offer $100,000 cash and all franchises and right-of-way for a proposed interurban railway to W. D. Boyce and associates, of St. Louis, Mo. The railway will cross the Brazos River.

BELLINGHAM, WASH.—We are officially advised that the Nooksack Valley Traction Ry. Co. plans to let contracts in about 90 days for building its proposed railway from Bellingham to Blaine, and from Bellingham to Sumas, Ferndale, Lynden, etc., 60 miles. Right-of-way has been secured. First section of survey has been made. J. S. Wheeler, Seattle, Wash., is Pres. The line will have an easy grade which will not be over 2%. Noted on Aug. 20.

SPOKANE, WASH.—Alex. M. Lupfer, Ch. Engr. of the Spokane, Columbia & Western Ry. Co., Terminal Bldg., Spokane, advises us that this company plans to build a line from Spokane to mouth of the Spokane River, via Davenport and Peach on the Columbia River, 70 miles in length. Surveys are made. Right-of-way is partly obtained. Date for letting contracts not certain. Work will be approximately 50% prairie and 50% mountain work. Clyde M. Graves, Terminal Bldg., Spokane, Pres.

SNOHOMISH, WASH.—An application has been made to the City Council by J. M. Shawhan and K. D. Brown for a franchise to build a street railway system in Snohomish.

SEATTLE, WASH.—A franchise has been granted by the Board of County Commissioners to the Seattle, Snohomish & Everett R. R. Co. for twelve miles over the county road of King County. The railroad will enter the city east of the State University and will connect with the 19th Ave. line of the Seattle Electric Co. at the north side of the portage. The third-rail system is prohibited, and the company agrees to move its rails on one side of the highway whenever the county road becomes a State aid road. The railroad is to be built within five years. As noted on June 18, "Chas. W. Kimball, Secy. and Gen. Mgr. of the Seattle, Snohomish & Everett Ry. Co., states that company is completing its surveys and will begin construction as soon as the route is established. It is to be a standard-gage electric road and it is planned to connect Seattle, Bothwell, Snohomish and Everett. The overhead trolley system will be installed. The company proposes to rent its power from the Seattle Electric Co. Capital, $500,000. Headquarters, 443 New York Block, Seattle. Officers: Clyde C. [illegible], Seattle, Pres.; J. R. McLa[illegible], Seattle, Vice-Pres." Noted on June [illegible].

STOCKTON, CAL.—San [illegible] Valley Electric Ry. Co. has been [illegible] California to build a standard [illegible] railway from Stockton to Mo[illegible] tance of about 35 miles. Capi[illegible] 000,000. Directors: M. L. [illegible], $1,000; H. E. Teter, of Stockton; and J. [illegible]ett and E. T. Zook and J. E. Weave[illegible]. Weir, Francisco. The line will run th[illegible] of San Camp, Manteca, Ripon and [illegible] French South San Joaquin Improveme[illegible]a. The promoter of the enterprise. [illegible] is the

RED DEER, ALTA.—The R[illegible]eer Ry. Co. probably will begin cons[illegible] next spring. It will build a [illegible] early electric railway, 40 miles lo[illegible]ard-gage and connect Red Deer and Nevis. [illegible] will trolley system will be adopted [illegible]overhead be rented from the Western C[illegible]er will tric Co., of Red Deer. It is [illegible]al Electintention of the company to [illegible] ultimate stations, one at Red Deer and [illegible]ruct two Coalbanks. Capital stock, $1[illegible]; other at visional directors: Geo. W. Sm[illegible]. Provisional John J. Goetz, F. W. Galbraith, Wm[illegible] Moore, J. Carlyle Moore, all of Red D[illegible].

LIGHT AND POWER PLANTS.

(* *denotes that this work is advertised in Engineering News.*)

NEW YORK, N. Y.—The following bids were received on Oct. 19, by Th[illegible]e Bingham, Police Comr., for the mat[illegible] necessary to install the lighting and [illegible] fixtures in the new building to b[illegible] erected on the block bounded by Grand [illegible]ter and Broome Sts. and Center Marke[illegible] boro. of Manhattan, for headquarters for [illegible] Police Department of the City of New [illegible]: Lord Electric Co., 213 West 40th [illegible] $16,850; Sterling Bronze Co., 107 Wes[illegible]5th St., $17,500.

PLATTSBURG, N. Y.—Bids are [illegible]ked until Nov. 18 by the Constructing Quartermaster, Plattsburg Barracks, for connecting a transformer station and installing an electric lighting system at this post; also for furnishing electrical energy for operating the system.

BUFFALO, N. Y.—The Board of Trustees of the City and County Hall building is considering the question of lighting the building with electricity. According to the plans prepared by J. J. O'Leary, Electrical Engr., it will require about 4,000 lamps. The Trustees propose to advertise for bids for the work.

HUNTINGTON, N. Y.—The Huntington Light & Power Co. will construct an addition to its power-house and will install a 500-KW. turbo-generator set and other necessary equipment. An issue of $50,000 in bonds will be made, it is stated, the proceeds to be used to pay for the proposed improvements. Edgar L. Street, 44 Wall St., New York, is Mgr.

NEW YORK, N. Y.—Bids are asked by the Department of Charities until noon, Oct. 30, for (a) the complete conduiting, electric wiring and all other work in connection with the installation of a complete electric lighting and power system for all the buildings and grounds under the jurisdiction of the Department of Public Charities, comprising and included in the Metropolitan Hospital District, Blackwell's Island, Boro. Manhattan; (b) for all materials and labor required for the complete sub-station, sub-station equipment, pole lines and all other work in connection with the lighting and power system for the Metropolitan Hospital District, but not included in this district, Blackwell's Island, Boro. Manhattan.

COLLEGE HILL (Beaver Falls post-office), PA.—Bids are asked by G. S. Caughey, Secy. Borough Council, until noon, Oct. 31, for furnishing and installing a gas engine driven electric light plant for the borough. H. W. Van Fleet is Borough Engr.

PHILADELPHIA, PA.—Bids are asked by William M. Smith, Acting Ch. of Bureau of Yards and Docks, Navy Dept., Washington, D. C., until Nov. 21, for additions and alterations in the navy buildings, Philadelphia, Pa., including the installation of switchboards, distributing system for lamps and motors, conduits, telephone and alarm systems, lighting fixtures, lamps, etc.; also two electric elevators to be operated by three-phase, 60-cycle, 220-volt motors. An appropriation of $100,000 has been made for the entire work.

WASHINGTON, D. C.—The contract for furnishing four 1,000-KW. and two 500-KW. turbo-generator sets at the navy yards at New York, Philadelphia, Norfolk, Va., Mare Island, Cal., and Bremerton, Wash., has been let to the WESTINGHOUSE MACHINE CO., Westinghouse Bldg., Pittsburg, Pa.

DANVILLE, VA.—An appropriation of $22,000 has been made for improvements to the municipal electric light plant, which will include an additional boiler, a 500-KW. turbo-generator set, etc., contract for which has been awarded to the ALLIS-CHALMERS CO., of Milwaukee, Wis. Frank Talbott is Supt. of the Water, Gas and Electric Dept.

NEWBERN, N. C.—The property of the Newbern Lighting & Fuel Co., at Newbern, being the gas plant, including the real estate, plant, fixtures and franchises, and all other property belonging to the Newbern Lighting & Fuel Co., will be sold to the highest bidder for cash at noon, Nov. 23. Geo. A. Nicoll, Receiver.

*WARREN, PA.—See under Water Works.

SUWANEE, GA.—Plans are being made to develop the water-power of Suwanee Falls, on the Suwanee River. D. G. Zeiger, 530 Edgewood Ave., Atlanta, Ga., Consult. Engr., is interested.

LAVONIA, GA.—It is stated that W. N. Edwards is interested in a project to erect a power plant in Lavonia. It is estimated that the work will cost $20,000.

OCALA, FLA.—Plans are being considered for developing water-power on the Withlacoochee River. W. N. Camp, of Ocala, Fla., is interested.

OSSIAN, IND.—The Town Board has granted a franchise to the Fort Wayne & Wabash Valley Traction Co. to furnish electricity for lighting the streets and residences of the town. A sub-station will be erected in Ossian.

CHICAGO, ILL.—The contract for installing electrical equipment in two sub-stations has been awarded to PASCHES BROS., 346 Dearborn St., Chicago, at $19,-. Carroll is City Electrician.

The Metropolitan Electric Co' is planning to construct a power plant at Chicago River, Grove 18th Sts., at a cost of $300,000. D. H. Burnham & Co., Railway Exchange, Chicago, are Archs.

CHICAGO, ILL.—The Sanitary District of Chicago has entered into a contract to supply the city of Blue Island with light and power. Compensation was fixed on a basis of returns to the district of $14,- per year and increases each year thereafter. The District is to take over the lighting system and supply current to the residents of the town at a rate of 10 cents per KW.-hour. The District granted the MORGAN SMITH & CO., a contract for supplying a power plant for detroit pumping station, 2,000 HP. more at Lockport. The contract calls for payment of $30,200.

LA CROSSE, WIS.—C. F. Lang, La Crosse, has applied to the State Railroad Commission for permission to establish a municipal electric light plant in La Crosse.

CEDAR RAPIDS, IOWA.—A dam across the Cedar River, to furnish power for a 2,000-HP. plant, is requested in a franchise made to the City Council. The dam is proposed to be erected above the Palisades. It is to be used for generating electricity. An auxiliary steam plant is to be provided for emergencies.

MINNEAPOLIS, MINN.—The Minnesota & Ontario Power Co. has been incorporated here with a capitalization of $7,000,000, to develop idle water power, supply electricity, establish a paper manufacturing center and conduct lumbering operations. The contract has been let to J. G. WHITE & CO., 49 Exchange Pl., New York, for the completion of the dam and hydro-electric power stations at International Falls and Fort Frances, and the construction of a ground wood sulphite and news print paper plant. The directors are Edward W. Backus and William F. Brooks, of Minneapolis; Warren Curtis and John A. Davis, of New York; A. S. Peabody and Alexander Smith, of Chicago, and Warren Curtis, Jr., formerly of Corinth, N. Y.

BUFFALO, MINN.—Bids are asked until Oct. 29 for a 50-KW. alternator, 19 arc lamps, transformers, etc., also pole line and wiring, construction material. O. Claussen, Engr., St. Paul. H. C. West, Recdr.

NEW PRAGUE, MINN.—ADOLPH KRAPF has secured the contract to construct an addition to the municipal electric light plant. It is proposed to install a storage battery.

ELLINWOOD, KAN.—See item under Water Supply—Irrigation.

ST. MARYS, KAN.—Bids are asked until Nov. 10 for the construction of an electric light plant, to cost about $15,000, and a water-works system, to cost about $47,000. Burns & McDonnell, of Kansas City, Mo., are Engrs.

ROGERS, ARK.—It is reported that the Rogers Light & Power Co. will extend and improve its lighting system. J. E. Felker, Mgr.

SHERMAN, TEX.—Bids are asked at the office of Henry Zimmerman, City Secy., until Nov. 2, for electrical machinery and deep well pumps, as per plans and specifications of P. C. Thurmond, City Engr. The citizens recently voted to issue $14,000 in bonds for extensions to the municipal electric light plant and $16,000 for improvements to the water-works system.

ESTES PARK, COLO.—Plans are being made to establish a hydro-electric plant in Estes Park. It is proposed to erect the power-house near the fish hatchery. The plant will furnish electricity for lamps for the buildings in the park and for heating the hotel. F. O. Stanley is Mgr. of the Estes Park Hotel.

ALAMOGORDO, N. MEX.—W. E. Fletcher and E. Krause, of El Paso, Tex., have acquired water rights along the Penasco River in the Sacramento Mountains and are planning to construct a canal which will divert the wter into Cox Canyon, where a hydro-electric plant will be installed. Transmission lines will be erected from the plant to Alamogordo, Cloudcroft, Orogrande and other towns in New Mexico and to El Paso.

SEATTLE, WASH.—The SEATTLE ELECTRIC CO. has closed a contract with the Alaska-Yukon-Pacific Exposition Co. it is stated, to furnish all the electrical energy that will be required for lamps and motors for the exposition. The contract covers a period beginning as soon as preparations can be made and continuing until Feb. 1, 1910, and provides for furnishing all material and apparatus in connection with the installation and furnishing the energy. The Seattle Electric Co. will establish and maintain an electrical department on the grounds and take charge of all electrical work in connection with the fair. A sub-station will be erected in the grounds and electricity will be transmitted over a high-tension line at 13,- volts and stepped down to 2,300 volts for general distribution to the various buildings. About 2,500-KW. will be required for lamps and motors for the use of the exposition, in connection with lighting the buildings and grounds and operating pumps, and an additional 2,500 KW. will be required for concessionaires, making a total of 5,000 KW. Stone & Webster, Stone & Webster Bldg., Boston, Mass., are Gen. Mgrs.

EUREKA, CAL.—Arrangements are being made by the owners of the Klondike Mine on Rush Creek to construct an electric plant to operate the Huntington Mill. It is proposed to construct a ditch 1,000 ft. long to divert the water from the Klamath River to operate the plant. A 150-KW. generator will be installed and the plant will furnish electrical energy to several mines in that vicinity. J. W. Downing is interested.

RED BLUFF, CAL.—Work will be started soon on the power plant to be erected by the Northern California Power Co. on the Hazen property. E. D. V. Johnson is Mgr., San Francisco.

STOCKTON, CAL.—Harry T. Compton, Consult. Engr., who was engaged by the Southside Promotion Committee to investigate the project of installing electric motors to be used for irrigation purposes, has submitted a report advising the use of electricity in connection with the work.

BOISE, IDAHO.—Articles of incorporation have been filed for the Teton River Light & Power Co., of St. Anthony; capital stock, $1,000,000. Incorporators are: G. E. Bowerman, John Donaldson, Charles Watson, T. W. Lee, J. C. Clay and J. H. McCoster.

BONNERS FERRY, IDAHO.—J. S. Drumheller, of Spokane, Wash., is making arrangements for the construction of a hydro-electric plant at Moyie Falls, eight miles from Bonners Ferry. The plant will furnish electricity in Sandpoint, Bonners Ferry and the mines within 50 miles of the falls. J. F. Reynaud, of Sandpoint, will have charge of construction of the plant.

MEXICO CITY, MEXICO.—The Aztec Queen Mining Co. is preparing to install a hydro-electric plant on the Miravelles River, in the territory of Tepic, for the purpose of generating electricity for operating the machinery of its Huicicila Mines and to operate an electric railway system which it proposes to build to connect its mines with the port of Platanitos. The proposed road will be about 16 miles long. It is estimated that about 4,000 HP. can be developed at the site of the proposed hydro-electric plant. The company has a capital stock of $3,000,000. W. E. Clark is Gen. Mgr.

SANTA ROSALIA, MEXICO.—The Chihuahua State Government has granted to R. J. de Morambert and Henry C. Mayer, Pres. and Secy., respectively of the Cia. Productora de Hielo y Electricidad, a concession to build at Santa Rosalia, Chih., an ice plant and an electric light and power plant.

BRIDGES.

(denotes that this work is advertised in Engineering News.)*

BUFFALO, N. Y.—The Bureau of Engineering is completing plans for the construction of a foot bridge across the Ohio Basin slip. Bids will soon be asked. Francis G. Ward, is Comr. Pub. Wks.

MASONVILLE, N. J.—PATRICK J. BYRNE, of Burlington, N. J., has been awarded the contract for constructing a county bridge between Hartford and Masonville, at about $4,000, this bid being about $700 lower than the next highest.

PHILADELPHIA, PA.—George R. Stearns, Dir. Pub. Wks., awarded to the MILLARD CONSTRUCTION CO., Pennsylvania Bldg., Philadelphia, on Oct. 22, a contract for the construction of a reinforced-concrete arch bridge on the line of Fox St., over the Richmond branch of the Philadelphia & Reading Ry., at $27,000. The work is to be finished in three months.

SOMERSET, PA.—The County Commissioners have awarded the contract for the new reinforced concrete bridge over Brush Creek in Northampton Township to the NELSON-MERYDITH CO., Lewis Block, Pittsburg, Pa.

It has been decided to erect a reinforced concrete bridge over Draketown Creek, near Draketown, Somerset County, and a steel bridge over the creek at Kimmell's Mills, this county. The latter bridge will be 60 ft. long, 14 ft. wide and will have a concrete floor. Bids will soon be asked.

BALTIMORE, MD.—The Harbor Board has approved the plans of Oscar F. Lackey, Harbor Engr., City Hall, for widening the Pratt St. bridge over Jones Falls to 120 ft. Estimated cost, $50,000.

*BEAUFORT, N. C.—Bids are asked by Capt. Earl I. Brown, Corps Engrs., U. S. A., Wilmington, N. C., until noon, Nov. 20, for constructing a steel draw-span highway bridge with pile and concrete foundations on Core Creek near here.

LEXINGTON, S. C.—Bids are asked until Nov. 5 by Lexington County for constructing a steel bridge over the Salunda River. G. H. Koon is County Superv.

SPARTANBURG, S. C.—The County Commissioners on Oct. 19 awarded the contract for the erection of a steel bridge, known as Hill's bridge, across the Tyger River to A. D. McCLAIN, of Spartanburg, at $9,950. Other bidders were: York Bridge Co., of York, Pa., $10,600; Gates Machine Co., of Burlington, N. C., $10,490; Canton Bridge Co., of Charlotte, N. C., $10,487; Joliet Bridge & Iron Co., of Columbia, S. C., $10,367.

PENSACOLA, FLA.—Bids are asked by the Board of County Commissioners of Escambia County until noon, Nov. 3, for the construction of a wooden bridge across "Little Bayou. A. M. McMillan is Clk. Bd.

RALEIGH, MISS.—Bids are asked by Smith County until Nov. 2 for the construction of a bridge across Ocohay Creek. J. B. Currie is Clk.

GRENADA, MISS.—Bids are asked by Grenada County until Dec. 7 for the construction of an iron bridge across Bogue Creek.

TOLEDO, OHIO.—Bids are asked until 10 a. m., Nov. 4, by the County Commissioners for constructing the superstructure of a bridge over the Miami & Erie Canal on River Road in Waterville Township. L. B. Bailey is Chn. Comrs.

BRYAN, OHIO.—Bids are asked until Oct. 31 by the Commissioners of William County, for the erection of the substructures and superstructures of several bridges. R. H. Weaver is County Audr.

MADISONVILLE, OHIO.—Bids will be received until Nov. 13 by the County Commissioners, Fred. Drelbs, Clk., Cincinnati, Ohio, for constructing a concrete bridge on Main St., Madisonville, Columbia Township.

TAYLORSVILLE, OHIO.—Bids for the construction of that part of the Taylorsville bridge, which was destroyed by the wind storm of last summer, were opened at the office of the County Commissioners on Oct. 19. There were eight bids, which call for steel work, as follows: Oregon Bridge Co., $12,860; Nelson, Meredith & Co., $13,375; Capitol Construction Co., $12,423; Riverside Bridge Co., $14,125; Pennsylvania Bridge Co., $13,390; E. L. Landor, $13,500; Delaware Bridge Co., $12,777; Brookville Bridge Co., $11,145; Mount Vernon Bridge Co., $11,-839.

SALEM, IND.—Bids are asked until 1:30 p. m., Nov. 2, by Sam. G. Ellis, County Audr., for constructing a bridge over Carters Creek.

PRINCETON, IND.—Bids are asked until 11 a. m., Nov. 4, by Harry Embree, County Audr., for the construction and repair of certain bridges.

RENSSELAER, IND.—Bids are asked by the Commissioners of Jasper County until Jan. 12 for the construction of a bridge over the Kanku River. J. H. Leatherman is County Audr.

INDIANAPOLIS, IND.—Bids will be received by the County Commissioners until Nov. 4 for constructing the superstructure of the bridge over Eagle Creek on Mars Hill Road. Albert Sahm is County Audr.

TIPTON, IND.—Bids are asked until 2 p. m., Nov. 6, by J. F. Barlow, County Audr., for constructing a joint county bridge.

RICHMOND, IND.—Bids will be received until Oct. 31 by the County Commissioners, Richmond, for constructing eight concrete bridges and repairing two swinging bridges. Demas S. Coe is County Audr.

DETROIT, MICH.—The Department of Parks and Boulevards has had plans prepared for a bridge over the marsh run on Belle Isle. Bids will soon be asked. Philip Breitmeyer is Comr.

CENTRALIA, ILL.—Bids are asked by the City Clerk until 7 p. m., Nov. 3, for the construction of a wooden bridge.

*CHICAGO, ILL.—Bids will be received until noon, Nov. 11, by the Clerk of the Sanitary District of Chicago for building a reinforced-concrete dam, and for performing certain collateral bridge work. The work includes the excavation of about 150,000 cu. yds. of earth the building of a reinforced-concrete dam on the north branch of the Chicago River, the construction of substructures and the erection only of the superstructures of highway bridges at Foster Ave., Argyle St. and Lawrence Ave., all situated between the south line of Lawrence Ave. and the north line of Foster Ave. Robert R. McCormick is Pres. Bd. of Trustees.

FREMONT, NEB.—Bids will be received until Nov. 10 by the County Commissioners, Fremont, for furnishing material and constructing the substructure, superstructures and approaches to several county bridges.

BEATRICE, NEB.—The Board of Supervisors of Gage County has awarded the contract to the STANDARD BRIDGE CO., of Omaha, Neb., at $3,318, for the construction of one 130-ft. steel bridge, with 20-ft. approach, across the Big Blue River in Rockford Township. B. H. Conlee is County Clk.

FARGO, N. DAK.—Bids will be received until noon, Nov. 4, by Arthur G. Lewis, County Audr., for constructing a new bridge, 40 ft. long, in Mapleton Township, new bridge 110 ft. long in Rush River Township, and repairing bridge 140 ft. long in Durbin Township.

SIOUX FALLS, S. DAK.—No bids were opened on Oct. 15 by W. A. Cornell, County Audr., for the bridge over Big Sioux River at Eighth St. The matter was referred back to the committee to report at some future date and also to consider the building of a concrete bridge.

MISSOULA, MONT.—The Oliver Bridge Co., 1411 West Mallen Ave., Spokane, Wash., which was awarded the contract on Sept. 23 for the construction of the Higgins Ave. bridge, has obtained permission to withdraw its bid on the ground that the letting of the contract had not been strictly in compliance with the law, which calls for competitive bidding.

KANSAS CITY, MO.—J. L. Darnell, City Engr., is preparing plans for a reinforced-concrete bridge at Independence Ave. and Blue River, for the Board of Public Works. Estimated cost, $25,000. Bids will soon be asked.

KANSAS CITY, MO.—We are officially advised that the plans for the Main St. viaduct were officially approved on Oct. 22 by the president of the Kansas City Belt Ry. Co. and the Board of Public Works. Construction will begin as soon as possible. The structure will consist of a reinforced-concrete approach and 15 steel plate girder arches. The total length of the steel structure will be 760 ft., the spans varying from 38 ft. to 78 ft. 9 ins. The floor will be reinforced concrete with asphalt pavement and granitoid sidewalks and a concrete ballustrade at each side. Extreme width 60 ft. Total weight of steel, about 700 tons. The viaduct will cross the east end of the platforms of the new Union Ry. station, and the Station Co. will build five additional spans, of a total length of about 260 ft., when the station is built. The viaduct is being built by a private company of property-owners with J. Logan Jones, Pres., and Kenneth Hartley, Engr. It will be given to the city when completed.

MARKED TREE, ARK.—J. E. CLANTON, Tyronza, Ark., has been awarded the contract, at $9,500, for the construction of a steel bridge across the St. Francis River here.

*AUSTIN, TEX.—Plans and specifications are on file at the office of Engineering News, New York, for the construction of a reinforced-concrete arch bridge over the Colorado River in Congress Ave., and for the removal of the steel bridge now there. Bids are asked until Nov. 5.

DENVER, COLO.—Plans for the construction of the 20th St. viaduct are about completed and contracts for the masonry foundation and the approaches will probably be let in a few days. H. S. Crocker, Consulting Engr., will be in charge of the work. The estimated cost of the viaduct will be $515,000. That portion of the viaduct devoted to general traffic will be 34 ft. in width, and will have 6-ft. sidewalks of concrete on each side. The surfacing of the main part of the roadway will be with creosote blocks. The laying of the sidewalks and roadways will be under separate contracts.

VESTA, WASH.—Bids will be received until Nov. 2 by the County Auditor for the construction of a 100-ft. span wooden bridge over the North River at Vesta.

PASADENA, CAL.—JULIUS F. HALL, Alhambra, Cal., and R. B. MARTIN, Pasadena, have been awarded the contract, at $21,031, for the construction of a reinforced-concrete bridge across the Arroyo Seco, at Linda Vista Ave., Pasadena.

SAN FRANCISCO, CAL.—We are officially advised that the SAN FRANCISCO BRIDGE CO., S. G. Hindes, Pres., 865 Monadnock Bldg., San Francisco, has been awarded the contract by the Atchison, Topeka & Santa Fe Ry. Co. for the erection of a bridge across the Tuolumne River, about 110 miles south of San Francisco. The structure is a single-track, Class AA railroad bridge, with ballasted deck, and consists of seven 100-ft. deck girder spans, one 70-ft. deck girder span, and one 28-ft. I-beam span. The foundations have been completed, the concrete piers being 80 ft. high and all carried on piles. The base of the concrete is 30 ft. below the river level, and was put in by means of cofferdams of steel sheet piling. These piers contain 8,000 cu. yds. of concrete.

BRIGHAM CITY, UTAH.—Bids will be received until noon, Nov. 2, by N. J. Valentine, County Clk., for cutting down of hill, building grade and approaches to steel bridge across Malad River.

ALMA, N. B.—Bids will be received until noon, Nov. 2, by John Morrissey, Chn. Comr. Dept. of Pub. Wks., Fredericton, N. B., for the construction of a steel and concrete bridge at Point Wolfe. Plans and specifications may be seen at the department and also at the offices of Walter B. Dickson, Hillsborough, N. B., George D. Prescott, Albert, N. B.

ELGIN, N. B.—Bids will be received until noon, Nov. 2, by John Morrissey, Ch. Comr. Dept. Pub. Wks., Fredericton, N. B., for the construction of a steel and concrete bridge over Pollett River at Elgin. Plans and specifications may be seen at the department and also at Goddard Bros.' store, Elgin, and at the store of I. C. Prescott, Albert.

ST. JACQUES, N. B.—Bids will be received until noon, Nov. 2, by John Morrissey, Ch. Comr. Dept. Pub. Wks., Fredericton, N. B., for the construction of a steel and concrete bridge over Silver Stream. Plans and specifications may be seen at the department and at the offices of Charles Cyr, St. Leonard's, N. B., and Jesse W. Baker, Madawaska, N. B.

BUILDINGS.

(denotes that this work is advertised in Engineering News.)*

PITTSFIELD, MASS.—Contract has been let to ROSCOE & STONE, of Pittsfield, to erect a 4-story business block for McCormack & Joyce, at North St. and Maplewood Ave. Estimated cost, $50,000.

BOSTON, MASS.—Bids for enlarging the court-house in Pemberton Sq. by the addition of two stories were opened on Oct. 17. The bids were as follows: Norcross Bros. Co., $786,000; L. P. Soule & Son Co., $767,-941; John Gill & Son, $730,193; F. T. Nesbit & Co., New York, $672,000; William Crane, $757,402; Woodbury & Leighton Co., $797,633; Conners Bros. Co., Lowell, Mass., $692,245; George A. Fuller & Co., $699,000; McNeil Bros., $825,000. All are of Boston unless otherwise specified. George A. Clough is Arch.

CAMBRIDGE, MASS.—The contract for rebuilding the Prospect House has been let to J. B. BYRNE, 228 Main St., at about $40,000. Newhall & Blevins, 9 Park St., Boston, Mass., are Archs.

BOSTON, MASS.—E. P. Whitney, Alfred Bowditch and Robert H. Gardiner, Trustees of the estate of the late William Lawrence, will erect an office building of ten stories, to be known as the Lawrence Building. It will be erected on the corner of Devonshire and Water Sts., on the site of the old granite building numbered 83 to 85 Devonshire St. There will be a frontage of 71 ft. on Devonshire St. and nearly 64 ft. on Water St. The building is from plans by Parker, Thomas & Rice, Archs., 110 State St. Work on demolishing the old structure covering the lots has been started. The contractors are L. P. SOULE & CO., and the contract agrees that the builders are to deliver the building, fully completed and ready for occupancy on Sept. 1, 1909. The contractors on the razing of the present structure are A. A. ELSTON & CO. Cost, $350,000.

WAKEFIELD, R. I.—Horace Trumbauer, Arch., Philadelphia, has awarded to GEO. F. PAYNE & CO., a contract for remodeling the summer residence of Edward Welsh, of this city, at Wakefield, R. I., and for the erection of a stable and garage. The cost will be about $100,000.

HARTFORD, CONN.—The Board of Contract and Supply has rejected all bids for the proposed fire engine house to be built on Fairfield Ave., as they were in excess of the appropriation. Amended bids were submitted, but these were rejected also, as being in violation of the ordinances. The work will be readvertised.

NEW YORK, N. Y.—Plans have been filed with the Buildings Superintendent for a 6-story apartment house to be built at the corner of Riverside Drive and 127th St., south of the viaduct, for the Riverside Viaduct Realty Co., Joseph Newmark, Pres. It is to be of the Renaissance type, of limestone at the first story and brick above, with a

large ornamental entrance. It will have a frontage of 86.6 ft. on the drive. Its depth will be 124½ ft. It will contain 40 suites of apartments, and will cost $225,000. Geo. F. Pelham is Arch.

Kramer & Rockmere have filed plans for a 7-story store and loft building, to be erected at the corner of Ave. A and Seventh St., at a cost of $65,000. G. F. Pelham is Arch.

Plans have been completed by Denby & Nute, 333 Fourth Ave., for the construction of an apartment house to cover a plot 100 x 87 ft., at the corner of Broadway and 164th St., Washington Heights, and to cost $200,000. J. O'Brien, 647 Sixth Ave., and M. Caravatta, 212 West 90th St., are the owners.

Schwartz & Gross, Archs., 347 Fifth Ave., have been commissioned to prepare plans for the construction of two 12-story elevator apartment houses for the Carlyle Realty Co., 198 Broadway, to be erected in the north side of 110th St., east of Broadway, and to cost together $1,000,000. There will be four family apartments on each floor. No bids have been taken.

The following bids were received on Oct. 15 by Louis F. Haffen, Pres. Boro. of The Bronx, for furnishing material and erecting a stable, wagon house and tunnel for use of Bureau of Highways of Boro. of The Bronx, to be erected on East 181st St. and Webster Ave.: Calumet Construction Co., 19 East 59th St., $42,739; John H. Parker Co., 42 East 23d St., $45,565; Thomas Cockerill & Son, 147 Columbus Ave., $44,50); Thomas J. Buckley Construction Co., 410 Tenth Ave., $41,150; J. & L. Moreland & Co., 1910 Park Ave., $41,795; Guidone & Gariardi Co., 147 East 23d St., $38,500; Kelly & Kelley Co., 45 East 42d St., $40,450; H. C. Kelly & Co., 271 East 125th St., $44,470; Concourse Construction Co., 590 Highbridge Road, $39,232; H. I. English Construction Co., $48,726.

NEW YORK, N. Y.—We are officially advised that estimates are being received by the Brunswick Realty Co., care of F. C. Zobel, Arch., 114 East 28th St., for a 10-story office building, 20 × 40 × 200 ft., to be erected at 118 East 28th St., and 121 East 27th St. The building will cost $300,000.

The Municipal Art Comn. of New York City on Oct. 15 approved designs for a pavilion for the new 4-story rubble masonry tuberculosis infirmary on Blackwell's Island, to cost $300,000.

ALBION, N. Y.—The contract for erecting, plumbing, heating, etc., buildings and additions to boiler house at Western House of Refuge for Women at Albion has been awarded to L. C. WILLE, Lockport, for $48,048.

TROY, N. Y.—Bids are asked until Oct. 30 by the Board of Contract and Supply, James M. Riley, Secy., for remodeling School No. 12. Loth & Milliman, Archs., 253 Broadway, Troy. Also School No. 13, Harry P. Fielding, Arch., 282 River St.

ALBANY, N. Y.—We are officially advised that the NATIONAL FIRE PROOFING CO., 115 Adams St., Chicago, Ill., has secured the contract for the fireproofing, partitions, wall furring and column covering in the New York State Educational Building, at Albany.

NEW YORK, N. Y.—Bids are asked by Louis F. Haffen, Pres. Boro. the Bronx, until 11 a. m., Nov. 9, for the erection and completion of stable building, wagon house and tunnel for the use of the Bureau of Highways of the Borough of the Bronx, to be erected on plot of land situated on the north side of East 181st St., bounded by Webster Ave. and Park Ave., the Bronx.

NEW YORK, N. Y.—Bids were received as follows on Oct. 23 by John F. Ahearn, Pres. Boro. of Manhattan, for alterations in rooms on sixth and seventh floors; also for extension to the electric lighting equipment; for carpentry and cabinet work, hardware, metallic and other furniture, painting, electric lighting fixtures, marble and bronze work, plastering, fireproofing and other work in the Hall of Records Building, New York: George W. Cobb, Jr., 140 Nassau St., $43,-230; Wm. Werner, $51,845; John T. Brady & Co., $47,880; A. & W. Gray & Co., $46,700; Neptune B. Smythe, $46,430.

ALBANY, N. Y.—The State Lunacy Commission has awarded to the GRISCOM SPENCER CO., of 90 West St., New York, at $7,500, the contract for furnishing and installing boiler, heater, tank and piping at the Long Island State Hospital at Flatbush, N. Y., and also has awarded to JOHN DYER, Jr., of Albany, the contract for the construction of conduit, including steam piping for the Acute Hospital at the Binghamton State Hospital, Binghamton, N. Y., at $6,470. F. B. Ware is State Arch.

NEW YORK, N. Y.—Bids are asked until 10.30 a. m., Nov. 2, by Nicholas J. Hayes, Fire Comr., for furnishing all the labor and materials required for the erection and completion of a new building for Engine Company No. 163 and Hook and Ladder Company No. 67, to be located on the south side of Flushing Ave., west of Twelfth Ave., Long Island City, Borough of Queens.

NEW YORK, N. Y.—Bids are asked by C. B. J. Snyder, Supt. School Bldgs., New York, until 3.30 p. m., Nov. 2, for additions to building and alterations to the site of Morris High School, on 166th St., between Boston Road and Jackson Ave., and extending back to Home St., Borough of The Bronx; for erecting deck houses, partitions, etc., on training ship "Newport," and also on Recreation Pier at the foot of East 24th St., Borough of Manhattan; for installing heating and ventilating apparatus in new Public School No. 114, on James, Oak and Oliver Sts., Borough of Manhattan.

NEW YORK, N. Y.—The firm bidding $262,840, the lowest bid submitted to the Department of Correction, on Oct. 20, for improvements to the City Prison, Brooklyn, N. Y., was J. B. Brady & Co., 103 Park Ave., New York, instead of B. J. Brady & Co., 1123 Broadway, as incorrectly stated last week.

FORT HANCOCK, N. J.—We are officially advised that contracts were awarded as follows on Oct. 23 for the construction proper, plumbing, electric wiring and fixtures in one double set of non-commissioned officers' quarters and two double sets of firemen's quarters at this post: Non-commissioned officers' quarters: Construction proper, ROBERT J. WALSH, Highlands, N. J., $6,-487; plumbing, HINES & HAMMER, Long Branch, N. J., $630; electric wiring, etc., S. EDWARD EATON & CO., Long Branch, N. J., $316. Firemen's quarters: Construction proper, ROBERT J. WALSH, Highlands, N. J., $10,302; plumbing, HINES & HAMMER, Long Branch, N. J., $1,200; Electric wiring, etc., S. EDWARD EATON & CO., Long Branch, N. J., $498. Lieut. W. J. Hawkins is Const. Q. M., U. S. A.

FORT HANCOCK, N. J.—Bids will be received by W. J. Hawkins, Q. M., U. S. A., until 3 p. m., Nov. 18, for new plumbing and construction in Barracks 22, 23, 24 and 25 at this post.

BAYONNE, N. J.—Bids are asked until Nov. 5 by William J. Temlin, Secy. Bd. of Education, for erecting a high school according to plans prepared by John T. Rowland, Jr., and Frank Eurich, Jr., Archs., 15 Exchange Pl., Jersey City. Bids will be received separately on the following: Mason work, carpenter work, painting, plumbing, ventilating and heating, electrical work, also on labor and material, as a whole, including all branches of the work.

BRIDGETON, N. J.—James Knox Taylor, Arch., Treasury Dept., Washington, has awarded contract for the construction of a post-office at Bridgeton, N. J., to WILLIAM F. HOLDING, 2426 Davidson Ave., New York, at $46,180. Time, Dec. 1, 1909.

VILLANOVA, PA.—Plans are being prepared by McIlvaine & Roberts, Archs., Land Title Bldg., Philadelphia, Pa., for four residences to be built for H. S. Kerbaugh, to cost, altogether, $100,000.

SCRANTON, PA.—The Delaware, Lackawanna & Western R. R. Co., Lincoln Busch, Ch. Engr., Hoboken, N. J., has applied for a permit to erect a passenger station and train shed here to cost $449,000, and an express station, foundry, blacksmith shop and other buildings to cost $149,000.

PHILADELPHIA, PA.—Henry L. Reinhold, Jr., is planning a theater to be built by a syndicate at 42d and Market Sts. It will measure 60 × 150 ft., and will seat 1,500 people.

A permit has been granted to W. W. Rea & Son to build a church at the corner of Tenth and Kimball Sts. for the First Italian Presbyterian Church at a cost of $40,000. Charles W. Bolton & Son are Archs.

Plans for alterations and additions to the U. S. Naval Hospital on Gray's Ferry road have been posted in the office of J. E. & A. L. Pennock for estimates. The drawings, which were prepared by the Bureau of Yards and Docks at Washington, provide for new lighting, heating and plumbing systems, in addition to the other work. The cost will exceed $100,000.

Bids for the erection of the William Brantley Hanna School, at 58th and Media Sts., were received on Oct. 20 at the meeting of the Property Committee of the Board of Education. The lowest bid was that of Sax & Abbott, 1328 Chesnut St., $179,853. Other bids were: George A. Glenn Co., $190,473; B. Ketcham, $189,565; James G. Doak, $189,-400; Cramp & Co., $190,792; J. E. & A. L. Pennock, $193,890; Henry E. Baton, $196,-157; Lynch Bros., $182,045; W. E. Dotts & Co., $185,000; Charles McCaul Co., 188,797; David Peoples, $185,597.

The Pennsylvania R. R. Co. has been granted a permit for the erection of a storage building on Delaware Ave., south of Catharine St., to cost $70,000.

*CARLISLE, PA.—Bids are asked by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., until 3 p. m., Dec. 2, for construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring), of the U. S. post-office at Carlisle.

*MILFORD, DEL.—Bids are asked by the Treasury Department until 3 p. m., Nov. 27, for complete construction of U. S. post-office at Milford. James Knox Taylor, Superv. Arch., Washington, D. C.

HAGERSTOWN, MD.—James Knox Taylor, Superv. Arch., Treasury Dept., Washington, has awarded to M. P. WELLS, Witherspoon Bldg., Philadelphia, the contract for the construction of a post-office at Hagerstown, Md., at $51,877. List of bidders noted on Oct. 15.

WASHINGTON, D. C.—Bids will be received until Oct. 31 by the Public Printer at the U. S. Government Printing Office, Washington, D. C., for furnishing and installing a passenger elevator car and appurtenances, elevator shaft, inclosures and automatic book lift in the west end annex, H St. wing, of the Government Printing Office, Washington.

The Supervising Architect of the Treasury, Washington, D. C., has awarded to the YORK SAFE & LOCK CO., York, Pa., contract for the construction of a vault in the office of the Comptroller of the Currency at $23,214.

WASHINGTON, D. C.—Bids are asked for marble column shafts. See under Miscellaneous Contracts.

WASHINGTON, D. C.—Bids are asked by the District Commissioners until Oct. 31 for the erection of the second addition to the McKinley Manual Training School, for which Congress appropriated $125,000. The second addition will occupy the space on Seventh St. side of the main building.

Proposals for work on the Union Station plaza improvement, for which Congress appropriated $100,000, and the Terminal Co. is to add $50,000, were received on Oct. 19 by the District Commissioners. The proposals are for masonry work, ornamental work and granite work. The bidders and their prices follow: For granite work, David M. Andrews Co., Baltimore, Md., $67,000; Woodbury Granite Co., Hardwick, Vt., $65,-000. For ornamental iron work, Charles Riggin, Co., Philadelphia, Pa., $25,560; Chicago Ornamental Iron Co., $24,588, and L. Schriber Sons, Cincinnati, Ohio, $29,633. For masonry work, Rudolph S. Blome Co., Chicago, Ill., $29,980, and the Cranford Paving Co., of Washington, D. C., $26,750.

ST. AUGUSTINE, FLA.—Philip E. Robinson and M. J. Reidy, Associate Archs., National Bldg., Savannah, Ga., have prepared plans for a 2-story and basement brick school building, 75 × 212 ft., to be built at St. Augustine. Cost, $60,000.

YOUNGSTOWN, OHIO.—James Knox Taylor, Superv. Arch., Treasury Dept., Washington, has awarded contract for the construction of a post-office at Youngstown, Ohio, to the BEDFORD STONE & CONSTRUCTION CO., Indianapolis, Ind., at $87,-569. Time, Aug. 31, 1909.

FREMONT, OHIO.—Bids are asked until Nov. 10 by the Board of Education, Fremont, for erecting a high school to cost $75,000.

SPRINGFIELD, OHIO.—The Supervising Architect of the Treasury, Washington, D. C., has awarded contract to W. W. LUYSTER, Dayton, Ohio, for the construction of an extension to the post-office at Springfield, at $33,350.

FORT WAYNE, IND.—Meade & Hamilton, Archs., Cleveland, Ohio, are preparing plans for a 1-story steel and concrete office building to be built for the Schoaff Estate at Berry and Calhoun Sts. Bids will be received at once. Cost, $125,000.

DETROIT, MICH.—Harry J. Rill, Arch., has let contract for the building of the church, school and boiler house for the St. Leo Congregation at Grand River Ave. and 15th St., Rev. Fr. Meathe Rector. The ground plan of the church proper is 90 × 180 ft., and of the school 62 × 77 ft. The seating capacity of the church will be 1,200. It will be of a Renaissance style, of architecture, and will cost $115,000. The mason work will be done by HENRY CAREW; carpentering by NEHLS & WINTER; plastering by SCHAEFER & SON; heating by E. RYAN; plumbing by JOHN KENNEDY; marble work by PHILIP CHRISTA & SON; mosaic work, VENETIAN MARBLE & MOSAIC CO.; iron construction, H. B. LEWIS; hardware, — RAYL; painting, M. E. VON MARCH; electric wiring, DONAHUE & SHOEBOTTOM.

CHICAGO, ILL.—Bids for the new terminal station of the Chicago & Northwestern Ry. Co. were opened at a meeting of the directors on Oct. 15. The bidders were as follows: George A. Fuller Co., George W. Jackson (Incorporated), C. Everett Clark Co., Falkenau Construction Co., Charles W. Gindele Co., William Grace Co., Wells Bros. Co., Thomson-Starrett Co., Lanquist & Illsley, John Griffiths & Son, Ralph & Sumner, Sollitt Co., Clark Construction Co., John Peirce Co., C. T. Wells, and Hedden Construction Co. The last two are New York firms; all the others are Chicago firms. The cost of the building itself is estimated at about $5,000,000. The train shed, platforms, approaches, etc., will cost about $5,000,000 additional.

We are officially advised that W. A. Wieboldt, 931 Milwaukee Ave., will build a theater at Division St. and Ashland Boulevard, to be known as the Crown Theater. The building will be 86 × 120 ft., fireproof, of brick and terra cotta construction, and will cost $150,000. The general contract has been awarded to the C. EVERETT CLARK CO., 100 Washington St., Chicago. R. C. Berlin, 153 La Salle St., Chicago, is Arch.

We have been officially informed that the Roman Catholic Eph Epheta School for the Deaf, will be built at 1897 West 40th Ave. at a cost of $100,000. The building will be three stories high, of brick and cut stone, 230 × 179 ft. Egan & Prindville, 85 Dearborn St., are Archs.

We are officially informed that A. C. McClurg & Co., 457 Ohio St., will erect a warehouse at 484 Ontario St. to cost $100,000, according to plans of Marshall & Fox, Archs., 919 First National Bank Bldg. The building will be of brick, steel and concrete, 100 × 135 ft., with six stories and basement. HENRY ERICSSON, 84 La Salle St., has the contract for foundation, masonry, concrete and carpenter work, at $57,675.

CHICAGO, ILL.—We are officially informed that C. M. Palmer, Arch., Monadnock Block, is preparing plans for an 8-story mercantile building, 51 × 166 ft., to be erected at 1223 Wabash Ave. for the E. L. Brand Estate, 73 East Jackson Boulevard. It will be of mill construction and contracts will be let separately. Cost, $80,000.

CHIPPEWA FALLS, WIS.—James Knox Taylor, Superv. Arch., Treasury Dept. Washington, has awarded contract for the construction of a post-office building at Chippewa Falls, Wis., to HERBERT T. HAZELTON, 305 Dearborn St., Chicago, Ill., at $66,500. Time, July 1, 1910.

ST. PETER, MINN.—Bids are asked by the State Board of Control, at St. Paul, until Nov. 2, for erecting a hospital building for the Criminal Insane at St. Peter. Clarence H. Johnson, 712 Manhattan Bldg., St. Paul, is Arch.

CROOKSTON, MINN.—Bids are asked by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., until 3 p. m., Nov. 17, for the construction, including plumbing, gas piping, heating apparatus, electric conduits and wiring, of the U. S. post-office at Crookston, Minn.

*NEWTON, KAN.—Bids are asked until 3 p. m., Dec. 1, by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. post-office at Newton.

OMAHA, NEB.—A 7-story warehouse, 132 x 70 ft., is to be erected by the International Harvester Co. of America, at Eighth St. and Capitol Ave. Cost, about $100,000.

MILLBANK, S. DAK.—A [illegible] be built here by the Coun[illegible] it is stated, at a cost of $8[illegible]

KANSAS CITY, MO.—A [illegible] granted to the Chicago Rea[illegible] has been a 5-story brick and stone [illegible] to erect at 1112 Armour Boulevard. [illegible] $75,000.

CAPE GIRARDEAU, MO. [illegible] Taylor, Superv. Arch., T[illegible] Knox Washington, has awarded [illegible] Dept. construction of a post-offic[illegible] for the ardeau, Mo., to M. YEAG[illegible] Cape Gir-Danville, Ill., at $93,252. [illegible] SON, of 1909. [illegible] Dec. 1,

ST. LOUIS, MO.—Otto J. F[illegible] Arch., is preparing plans for a 3-story [illegible]ter, danc-ing hall, restaurant and bow[illegible] alleys for the Arlington Amusement Co[illegible]

The contract for constructin[illegible] $75,000 Protestant Episcopal Church [illegible] proposed sion has been let to the WI[illegible] Assen-ERLAND CONSTRUCTION [illegible] M SUTH-$50,000. Mariner & Le Bau[illegible] about Rev. A. A. V. Binnington is [illegible] Archs.

FORT SMITH, ARK.—The [illegible] B. O. E. has awarded contract to W. F[illegible]AY & CO. Fort Smith, for erection of [illegible],000 club building, 50 × 140 ft., four sto[illegible] and base-ment, with brick and stone [illegible] walls, reinforced-concrete beams, ro[illegible] floors and girders. The contract inclu[illegible] plumbing, electric wiring, heating, elevator[illegible] and dumb-waiters.

HOUSTON, TEX.—Plans and [illegible]fications are on file at the office of Engi[illegible]ring News, New York, for proposed [illegible] County Court-House. Lang & Wit[illegible] Wilson Bldg., Dallas, Tex., are Archs.

OKLAHOMA CITY, OKLA.—F. B. Ziegler has approved plans by A. J. Williams, Old Post-office Bldg., Oklahoma City, for an apartment house, to be built of brick and terra cotta, 125 × 140 ft., with 18 apartments, containing seven rooms each, making total of 105 rooms. Cost, 75,000. Contract will be awarded soon.

DENVER, COLO.—An expenditure of $12,-000,000 is about to be made by the Denver & Rio Grande R. R. Co. for enlarging its terminals in Denver, Pueblo, Grand Junction, Salida and Salt Lake City and for the purchase of additional equipment. J. G. Gwyn, Denver, is Asst. Engr. of Bridges and Roadway.

TRINIDAD, COLO.—Bids are asked by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., until 3 p. m., Nov. 20, for the construction, including plumbing, gas piping, heating apparatus, electric conduits and wiring, of the U. S. post-office at Trinidad.

TACOMA, WASH.—Frederick Heath, Arch., of Heath & Twichell, has completed drawings for the erection of an apartment building at the corner of Tacoma Ave. and North Second St., at a cost of $100,000. The building will be constructed by CORNELL BROS. The site covers five lots, which were acquired by a stock company composed of A. V. Love, of the Morris-Miller Co.; Albert Tozer, Frederick Heath, Cornell Bros. and others.

SAN FRANCISCO, CAL.—A structure to be known as the Lincoln Building will be erected at the corner of Market and Fifth Sts. The area to be covered by the building is 275 × 237.6 ft. It will have a basement and four stories, with fronts on Fifth and Market Sts., and the rear opening on a private street 37.6 ft. wide taken from the school lot leased by the Wise Realty Co. from the city. The exterior of the building on Market and Fifth Sts. will be in white glazed brick, and it will have pilasters extending upwards between the windows to the cornice, which will be in the same style. Estimated cost, $350,000.

We are officially advised that James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., has awarded the contract for the concrete work at the U. S. Mint at San Francisco to RICHARD KEATINGE & SONS, of San Francisco.

The Board of Trustees of the Mechanics' Institute has adopted the final preliminary plans for the new institute building to be erected on the south side of Post St., between Montgomery and Kearny Sts., and these plans are the basis of the architect's working drawings. Albert Pissis, who was selected as the architect, submitted his plans to the Board, and he received instructions to proceed with the detailed drawings. The building will be Class A, with a steel frame and modern in every respect. It will have nine stories and be laid out with a middle wing extending backward so that it will be T-shaped.

Sellon & Hemmings, Archs., 244 Kearny St., have prepared plans for a Class A building to be built by the State at Polk and Fulton Sts., for the use of State officials in this city. The estimated cost is $450,000. Estimates will be taken soon on this work. The interior will be marble and bronze finished, metal trim throughout and fast passenger elevators will be installed.

SAN JOSE, CAL.—Sellon & Hemmings, Archs., 244 Kearney St., San Francisco, Cal., are preparing plans for a 2-story reinforced-concrete building to be built in San Jose and which will be used as a State Normal School. The building will be built on the Quad plan, the site being 470 × 370 ft. The roofing will be of tile. Plans will be completed at once. The cost is estimated at $250,000. When finished the building will accommodate 1,000 students.

SAN BERNARDINO, CAL.—Plans have been completed by Sellon & Hemmings, Archs., 244 Kearney St., San Francisco, Cal., for the Southern California State Hospital's receiving building, which is to be located near San Bernardino. The building will be of concrete, two stories high and is to cost about $35,000.

SAN DIEGO, CAL.—Sellon & Hemmings, Archs., 244 Kearney St., San Francisco, Cal., have started plans for the new Teachers' Training School to be built in San Diego. The building will be of two stories, concrete construction and will cost about $60,000.

FOLSOM, CAL.—The plans have been completed for the 500-cell building to be erected of stone and concrete at the Folsom State Prison. The building will be erected by ... E. Huntington, and the cost is estimated at ... There will also be a new ... about $... gate 40 × 70 ft. erected at the stone ... at a cost of about $50,000. same ...

SOUTH PASADENA, CAL.—CARL LEONARDT has been awarded the contract for the reinforced concrete construction of the residence of ... Park, near South Pasadena, at Los ... comprises the exterior walls, the ... and roof slabs and amounts to ... columns, ... hollow tile with which all ... $58,950. ... will be encased, together with these ... and all interior finish, plumbing and ... wiring, will be let in subsequent contracts after Jan. 1. Myron Hunt and Elmer Grey are Archs.

PHOENIX, ARIZ.—The following bids were received for constructing a reinforced-concrete ... for the State Hospital here: Phoenix Reinforced Concrete Construction Co., $42,850; Robertson & Schindler, of Los Angeles, $42,728. Thornton Fitzhugh, of Phoenix, Arch.

TORONTO, ONT.—A permit has been applied for to construct the proposed Methodist Deaconess' Home at St. Clair Ave. and Avenue Road. Cost, $100,000.

John Kreitner, 77 Northampton St., Buffalo, will receive bids for the 4-story and basement vaudeville theater building, 100 × 167 ft., to be erected at Toronto by the Shea Amusement Co., of Buffalo. The building will be constructed of pressed brick, concrete and terra cotta. The estimated cost is $250,000. Leon H. Lempert & Son, Cutler Bldg., Rochester, N. Y., are Archs.

TORONTO, ONT.—We are officially advised that bids for steel construction are now ready and others will follow within two weeks for the brick, iron and terra cotta heater to be built by Shea & Kreitner, of Buffalo, N. Y., at the corner of Victoria and Richmond Sts., Toronto. Cost approximately $250,000. Building will be four stories high, 91 × 167 ft., fireproof. Leon H. Lemport & Sons, Cutler Bldg., Rochester, N. Y., are Archs.

WATER SUPPLY—IRRIGATION.

(denotes that this work is advertised in Engineering News.)*

BLANDFORD, MASS.—The following are the bids opened on Oct. 15 for a new water supply system: F. T. Ley & Co., Springfield, Mass., $17,660; Bryne Contracting Co., 53 State St., Boston, $16,914; Daniel A. Dorey, Natick, $16,305.

SYRACUSE, N. Y.—Bids were opened by the Board of Contract and Supply, Fred T. Pierson, Secy., on Oct. 19 for laying a conduit line from Skaneateles Lake to and into the city, a distance of about 20 miles. Contracts were awarded as follows: Section 1 to LANE & HENNESSEY, of Syracuse, at $105,945; Sections 2, 3 and 4 to CLINTON BECKWITH, of Herkimer, N. Y., at $150,295. George H. Beebe is Ch. Engr., Bureau of Water.

NEWBURGH, N. Y.—William J. Blake, City Engr., is preparing plans for increasing the capacity of the storage reservoir, the work to consist of raising Washington Lake dam three feet above the present elevation, increasing the area of the lake by 8.46 acres, and adding 150,000,000 gallons capacity, removing slope pavement on Cayler dam, c.-i. pipe and general construction.

SHERMAN, N. Y.—E. A. Wilder, Consulting Engr., of Fredonia, N. Y., has been engaged by the village to prepare the plans and specifications for the new water supply system.

TROY, N. Y.—It has been decided to construct two dams and raise the crest of another dam, to increase the water supply on the Queckenkill system. E. L. Grimes is City Engr.

*NEW YORK, N. Y.—Bids will be received by the Board of Water Supply, in the office of the Board, 299 Broadway, until 11 a. m., Nov. 17, for making borings along one or more lines south of Hill View Reservoir lying mainly in the Boroughs of the Bronx, Manhattan and Brooklyn, including lines crossing the Harlem River, probably between Seventh Ave. and Washington Bridge, and the East River approximately between the Williamsburg and Brooklyn bridges. Time allowed for the completion of the work is until Dec. 31, 1910. Pamphlets containing information for bidders, form of contract, specifications and contract drawings, can be obtained at Room 1515 at the above address, by depositing the sum of ten dollars ($10) for each pamphlet, to insure their return in acceptable condition within thirty days from the date upon which bids are to be opened. John A. Bensel is Pres. Bd.

ALBANY, N. Y.—Barge Canal.—See item under Miscellaneous Contracts.

SYRACUSE, N. Y.—Contracts were awarded on Oct. 19 by the Board of Contract and Supply for the construction of the second Skaneateles Lake water conduit as follows: First section, to LANE & HENNESSY, of Syracuse, at $105,945; second, third and fourth sections, to CLINTON BECKWITH, of Herkimer, N. Y., at $150,295.

NEW YORK, N. Y.—Bids will soon be asked by the Department of Water Supply, Gas and Electricity for the extension of the high pressure fire system. John H. O'Brien is Comr.

CAMDEN, N. J.—The Stone Harbor Water Co., of Camden, has been incorporated to operate water-works in Stone Harbor and the lower portion of Seven-Mile Beach in Middle Township, Cape May County, N. J. Capital, $50,000. The incorporators are: L. Starr, Woodbury; E. C. Waddington, Woodstown; W. S. Casselman, Jr., Camden.

*WARREN, PA.—Bids will be received by the Committee designated by the Board of Trustees of the State Hospital for the Insane, Warren, for furnishing and installing two 80-brake HP. natural gas engines; and for furnishing and installing two triplex power pumps of approximately 955 gallons per min. capacity. Plans and specifications will be furnished by Charles R. Simpson, Engr., at State Hospital, Warren, and information given to those who desire to bid.

OAKLAND, MD.—We are officially advised that contracts for the construction of water and sewer systems will not be let until about the first part of next year. Penniman & Fairley, Maine Bank Bldg., Baltimore, Md., are Engrs. J. H. Dunham is City Clk.

RICHMOND, VA.—Bids are asked until 5 p. m., Oct. 29, by E. E. Davis, Supt. W.-Wks., for erecting brick pumping station, adjoining steam pumping plant at the new power house.

FALLS MILLS, W. VA.—The Norfolk & Western Ry. Co., C. S. Churchill, Ch. Engr., Roanoke, Va., has awarded the contract to S. WALTON & CO., of Falls Mills for constructing a dam 15 ft. high and 475 ft. long on Mud fork of Bluestone River, near Falls Mills. The company has a pumping plant at Bluestone, used for pumping water for engine purposes from the Bluestone River. The new dam is intended to store waste water from Bluestone drainage area.

PENNSBORO, W. VA.—The city will expend about $12,000 in improvements to water-works. WILLIAM B. OSBORN, Clarksburg, W. Va., has been awarded the contract to erect a pump station and install pumping equipment, consisting of air-lift system combined with triplex power pump, both driven by gas engine.

The U. S. CONSTRUCTION CO., Columbus, Ohio, has the contract for construction of pipe-distributing system and water-storage tanks, including 100-barrel reservoir and 1,250-barrel tank.

PENSACOLA, FLA.—Bids are asked until 11 a. m., Nov. 21, by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for installing water-mains, pumping machinery, etc., at the navy yard, Pensacola. Specifications for this work are on file at the office of Engineering News, New York.

CLARKSDALE, MISS.—Bids will be received until 8 p. m., Nov. 10, by the Board of Aldermen for constructing ¾ mile 6-in. water mains, including hydrants and valves; also a reservoir about 80 ft. long and 55 ft. wide and 9 ft. deep, with metal shingle roof. Walter G. Kirkpatrick is Engr., Jackson; M. W. Purnell is City Clk.

NASHVILLE, TENN.—The City Council has passed the ordinance appropriating $60,000 for purchasing and laying water pipes in the suburban territory. W. W. Southgate is City Engr.

TOLEDO, OHIO.—Bids will be received until Nov. 4 by the Board of Public Service, Reynold Volt, Secy., for furnishing material and driving piling at the intake crib at the water-works pumping station.

DAYTON, OHIO.—The lowest bid opened on Oct. 12 by the Board of Public Service for installing air compressor in the water-works pumping station was submitted by the Pennell & Muid Construction Co., of Cincinnati, Ohio. William Budroe is Clk. Bd.

READING, OHIO.—We are officially advised that JOHN RYAN, Lockland, Ohio, was awarded the contract on Oct. 12 by the Board of Public Affairs for furnishing and laying water pipe, special castings, valves, hydrants, etc., on Columbia, East, Second, Mechanic and Pearl Sts. C. V. Dils is Clk. Bd.

EAST LIVERPOOL, OHIO.—We are officially advised that all bids for laying a 6-in. standard water main in Sixth St., from Jefferson to Monroe St., to Fourth St., etc., were rejected on Oct. 21 by the Board of Public Service as excessive. The line will be laid by the department. A. S. Hughes is Clk. Bd.

*MUSKEGON, MICH.—Bids were opened as follows on Oct. 19 by the city for a vertical triple-expansion crank and fly-wheel pumping engine of the semi-self-contained type with 6,000,000 gallons capacity in 24 hrs.: Wilson Snyder Mfg. Co., $37,500 and $40,000; C. H. Wheeler Mfg. Co., 18th and Lehigh Sts., Philadelphia, Pa., $38,900; Allis Chalmers Co., Milwaukee, Wis., $37,900; William Todd Co., $36,850; Platt Iron Works, Dayton, Ohio, $35,900 and $38,250; Holly Mfg. Co., 118 Liberty St., New York, $38,500; Bethlehem Steel Co., Keystone Bldg., Pittsburg, Pa., $35,900 and $44,000. Benjamin H. Tellman is City Recdr.

BLOOMINGTON, ILL.—Bids will be received until Oct. 29 by the Board of Local Improvements for constructing 5,301 ft. of 6-in. c.-i. water mains. Estimated cost, $6,311. Charles F. Fauntz is City Engr.

SPRINGFIELD, ILL.—Plans for the construction of a filter plant with a daily capacity of 8,000,000 gallons, are being prepared. F. H. Hamilton is City Engr.

WINTERSET, IOWA.—The citizens on Oct. 12 voted to issue $60,000 bonds for the construction of water-works. W. K. Palmer Co., Dwight Bldg., Kansas City, Mo., are Engrs.

ELLINWOOD, KAN.—We are officially advised that bids were received as follows on Oct. 19 for the construction of water-works and electric light systems: F. A. Huribut, Kansas City, Mo., $35,700; W. W. Cook & Sons, Pittsburg, Kan., $37,998; J. A. Bortenlanger, Omaha, Neb., $37,000; Squire Electric & Contracting Co., Kansas City, Mo., $35,500; MATHEWS ELECTRIC CO., 424 Shubert Bldg., Kansas City, Mo., $33,700 (awarded contract); Freeborn Engineering & Construction Co., Kansas City, Mo., $37,391; Joplin Electric Supply and Construction Co., Joplin, Mo., $35,772. The W. K. Palmer Co., Dwight Bldg., Kansas City, Mo., are Engrs.

LOWER BRULE, S. DAK.—The only bid received on Oct. 20 by the Commissioner of Indian Affairs, Washington, D. C., for the construction of an artesian well at Lower Brule Agency, S. Dak., was that of J. B. Smith, Pierre, S. Dak., at $2.20 per ft. to a depth of 1,400 ft., and $1.50 per ft. lower than 1,400 ft.

ALBA, MO.—We are officially advised that the contract for installing the water system here has been let to DAN HAMILTON, of Joplin, Mo. Bids were opened on Oct. 10. W. F. Barnett is City Clk.

NEW HAVEN, MO.—Contracts have been awarded for the construction of a portion of the water-works as follows: To U. S. PIPE CO., of St. Louis, for pipe, $3,300; to RENSSELAER MFG. CO., of Troy, N. Y., for hydrants and valves, and to O. G. WILSON, of St. Louis, for one 400-ft. deep well of 8 ins. diameter. W. A. Fuller, Chemical Bldg., St. Louis, is Engr.

DE QUEEN, ARK.—It is proposed to issue $25,000 bonds for the construction of water-works here. J. E. Brown is Secy. Improvement Bd.

ENNIS, TEX.—The city has voted $13,000 of bonds for the construction of water-works.

FORT WORTH, TEX.—Graham & Priddy, Fort Worth, are the lowest bidders at $4.50 per ft. for drilling test artesian well, 12 ins. in diameter, 1,000 ft. or more in depth, and cased with wrought iron, also with agreement to work over old well at $3 per ft. John B. Hawley is City Engr.

VERNON, TEX.—The city has voted the issuance of $15,000 of bonds for the construction of water-works. L. P. Bonner is Mayor.

MERKEL, TEX.—The city has voted bonds for the construction of water-works.

FORT McINTOSH (Laredo post-office), TEX.—Bids are asked until 10 a. m., Nov. 20, by Col. John L. Clem, Ch. Q. M., U. S. A., San Antonio, Tex., for furnishing and installing a new boiler and feed-water heater and purification apparatus here.

*HOUSTON, TEX.—We are officially advised that bids were received as follows on Oct. 19 by the Water Department for the complete installation of a 15,000,000-gallon pumping engine at the water plant: Bethlehem Steel Co., Keystone Bldg., Pittsburg, Pa. (seven bids), vertical triple expansion, $83,839, $73,985, $71,306; horizontal compound, $40,550; vertical triple expansion, sole plate and "K" brace, $89,439; same type $78,585; same type, $75,906. A. M. Lockett & Co., New Orleans, La. (two bids), vertical triple expansion, Holly, $76,595; horizontal compound, Snow, $58,744. Nordberg Mfg. Co., House Bldg., Pittsburg (two bids), horizontal compound, $47,515; horizontal triple expansion, $54,915. Allis-Chalmers Co., Milwaukee, Wis (four bids), vertical triple expansion, $96,300; same type, $89,100; same type, $84,415; horizontal compound, $55,730. Wisconsin Engine Co., vertical triple expansion, $94,900. The Nordberg Mfg. Co. stipulated that if the pump be connected with present Worthington pump the discharge pipe would be 30 ins., and auxiliary discharge 20 ins., and if connected independently discharge pipe would be 36 ins. and $500 would be deducted from total price.

*LAS ANIMAS, COLO.—Bids will be received at the office of the Town Clerk, Las Animas, until 2 p. m., Nov. 9, for furnishing material and labor and constructing water-works improvements as follows: Complete new pumping plant, including building and equipment; steel tank or standpipe; extensions and additions to present mains, approximating 23,000 lin. ft. of c.-i. pipe. All of the above work and material to be furnished and done in accordance with the plans and specifications on file in the office of the Town Engineer, Las Animas, and at the office of T. W. Palmer Co., Dwight Bldg., Kansas City, Mo. The work and furnishing of materials will be let as one contract. W. R. Murphy is Town Engr.

STERLING, COLO.—THE EMPIRE CONSTRUCTION CO., composed of D. A. Canfield and J. W. McCreery, of Greeley, Colo., and S. H. Shields, of Fort Morgan, Colo., secured the contract on Oct. 15 from the North Sterling Irrigation District to build 105 miles of ditch and construct a reservoir at a cost of $2,000,000. The district lies north and east of Sterling and will be supplied from the South Platte River and Cedar Creek.

SEATTLE, WASH.—R. H. Thomson, City Engr., has submitted estimates for local improvements as follows: Sixth Ave., N. E., and other streets, fire hydrants, $6,610; 15th Ave. and other streets, water mains, $7,150; 16th Ave., N. W., and other streets, water-mains, $15,300; 18th Ave., N. E., and other streets, water mains, $7,200.

*WENATCHEE, WASH.—Bids will be received by Sam R. Sumner, City Clk., until noon, Nov. 24, for the construction and completion of certain additions to and extensions of the existing water-works owned and controlled by the city. The work will consist of constructing a pumping station on the banks of the Columbia River at the foot of Fifth St. North, and construction of a pipe tunnel from pumping station to junction with the existing tunnel; furnishing pump, motor and starting panel; pipe line to reservoir; reservoir complete, including coping and iron fence; overflow pipe from reservoir. Bids may be for the entire work as set forth in the plans and specifications or for any of the several divisions of the work set forth in the plans and specifications. Roy Zahren is City Engr.

CELILO, ORE.—COUGHRAM, WINTERS, SMITH & CO. have been awarded the contract for constructing three miles of the government canal here.

SAN FRANCISCO, CAL.—Contracts were awarded on Oct. 14 by the Board of Public Works for the construction of five cisterns which are to be a part of the auxiliary fire protection system. C. COGHILL was awarded the contract for a cistern at Plymouth Ave. and Sadowa St. and another at Berkshire and Diamond Sts., at $6,600. The contract for cisterns at 47th Ave. and J St., Ninth Ave. and J St., and Fifth Ave. and I St. were let to the KEYSTONE CONSTRUCTION CO., 417 Montgomery St., San Francisco, at $10,398. Thirteen bids were received for the work. Marsden Manson is City Engr.

OGDEN, UTAH.—We are officially advised that the city has purchased a water-works system from the Ogden Water-Works Co., the same to be taken over on Jan. 1. Nothing whatever has been done toward reconstruction or new construction in any manner as yet. A. F. Parker is City Engr.

MONTREAL, QUE.—Bids have been opened for a reinforced concrete wall and supply conduits for the pumps at Point St. Charles Wheelhouse as follows: The REXFORD-BISHOP CO., $21,813 (awarded contract); P. McGovern, $37,637; J. Leahy & Co., $34,690; Henault & Heffernan, $41,658; The Hilder Daw Construction Co., $34,500.

SEWERAGE.

(denotes that this work is advertised in Engineering News.)*

HAVERSTRAW, N. Y.—Bids will be received by the Board of Village Trustees, Thomas Lynch, Pres., until Nov. 4, for constructing a sewerage system.

SYRACUSE, N. Y.—R. C. Allen, City Engr., is preparing plans for a 12-in. sewer in Eldorado St. and a 15-in. sewer in Elm and Robinson Sts. Bids will soon be called for by the Board of Contract and Supply.

ROCHESTER, N. Y.—F. C. LAUER & SONS CO., 458 Clinton Ave., South, are the lowest bidders at $20,075, for the construction of a sewer in North Water St. Edwin H. Fisher is City Engr.

BUFFALO, N. Y.—Bids will be received until Oct. 30 by the Department of Public Works, Francis G. Ward, Comr., for constructing a 12-in. tile sewer in a portion of Goemble St., and a portion of Hedley St.

SARANAC LAKE, N. Y.—JOHN B. DOENER, Ballston Spa, N. Y., has been awarded the contract for the construction of about two miles of sewers, at Saranac Lake. S. A. Miller is Village Clk.

RICHMOND HILL (Jamaica, L. I., post-office), N. Y.—The Board of Trade has decided to lay a sewer, by private contract, in Jamaica Ave., from Leffert's Ave. to Union Place at Brooklyn Hills, a distance of 4,500 ft. A committee has been appointed to get bids from contractors. The estimated cost is $25 per 20-ft. lot.

NEW YORK, N. Y.—Bids are asked until 11 a. m., Nov. 9, by Louis F. Haffen, Pres. Boro. of The Bronx, for constructing sewers and appurtenances in various streets.

CAMDEN, N. J.—The Common Council has authorized the construction of sewers, culverts and drains in Marlton Ave., from 24th St. to Highland Ave. L. E. Farnham is City Engr.

TRENTON, N. J.—The Common Council has authorized the construction of a sewer in Brunswick Ave., from Strawberry to Plum Sts. Harry B. Salter is City Clk.

ERIE, PA.—The proposed sewerage system to be constructed in the southwestern section of the Sixth Ward will cost $44,000. Benjamin E. Briggs is City Engr.

MONTGOMERY, PA.—JAMES H. NUSS and SIMON B. HOFFMAN have been awarded the contract to construct a sewer in Broad St., Montgomery. About 3,000 ft. of 8, 10 and 12-in. pipe will be required.

BALTIMORE, MD.—The Colonial Park Estates, John J. Watson, Pres., 763-769 Calvert Bldg., Baltimore, will lay about 3,000 ft. of storm-water drains, varying in size from 8 to 15 ins., and about 4,800 lin. ft. of vitrified sewer pipe, varying in size from 5 to 6 ins.

*WASHINGTON, D. C.—Bids are asked by the Commissioners of the District of Columbia until noon, Nov. 16, for constructing Section D of the east side intercepting sewer, boundary to Brookland.

*WASHINGTON, D. C.—Bids will be received by the Commissioners of the District of Columbia until noon, Nov. 16, for constructing service sewers in Conduit Road, District of Columbia. Forms of proposals, specifications, and necessary information may be obtained from the Chief Clerk, Engineer Department, Room 427, District Bldg., Washington.

MOUNT AIRY, N. C.—The Mount Airy Sewerage Co. has been incorporated with $10,000 capital stock by Rev. R. D. Haymore and others.

SARASOTA, FLA.—See item under Streets and Roads.

FLORALA, ALA.—The city has awarded the contract to J. B. McCRARY & CO., Atlanta, Ga., to construct a sewer system here. G. F. Petrey is Mayor.

CLARKSDALE, MISS.—Bids are asked until 8 p. m., Nov. 10, by the Board of Aldermen for constructing about 1¾ miles of 8-in. house sewers. W. G. Kirkpatrick is Engr., Jackson, Miss.

JOHNSON CITY, TENN.—BOSLER & FLYNN, Chattanooga, Tenn., have been awarded the contract by the city at about $20,000 for sewer construction here.

LEXINGTON, KY.—Bids were received as follows on Oct. 16 by John Skain, Mayor, for constructing sewers in (a) South Broadway Park, (b) South Broadway: Foster & Helm, (a) 6-in. pipe, 76 cts. per ft.; 5-in. pipe, 56 cts.; manholes, $25 each; flushtanks, $60 each; rock excavation, if any, $4 per cu. yd.; (b) 8-in. pipe, $1.25 per ft.; 5-in. pipe, 75 cts.; 5-in. Y branches, 20 cts. each; 18 bends, 60 cts. each; manholes, $25 each; flushtanks, $60 each. Joseph McIvin, (a) 6-in. pipe, 65 cts. per ft.; 5-in. pipe, 25 cts.; junctions, 50 cts. each; manholes, $35 each; flushtanks, $60 each; rock excavation, if any, $4 per cu. yd.; timber sheathing, if any, $25 per M.; (b) 8-in. pipe, $1.25 per ft.; 5-in. pipe, 85 cts. per ft.; junctions, 50 cts. each; manholes, $35 each; flushtanks, $60 each; rock excavation, if any, $4 per cu. yd.; timber sheathing, if any, $25 per M.

*LOUISVILLE, KY.—The FERRO-CONCRETE CONSTRUCTION CO., Richmond and Harriet Sts., Cincinnati, Ohio, was awarded the contract on Oct. 21 by the Commissioners of Sewerage for constructing Section E of the southern outfall sewer at about $110,000. Weber & Co., of Chicago, Ill., Hoglen & Paul, of Dayton, Ohio, and Henry Bickel & Son, of Louisville, also bid for this work.

SPRINGFIELD, OHIO.—Bids will be received by the Board of Public Service, William H. Mahoney, Clk., until Nov. 5, for furnishing material and constructing sewers in Fountain, Euclid and Lagonda Aves. and other streets.

IRONTON, OHIO.—The proposed concrete storm water sewers will cost about $45,000. Nothing will be done in the way of construction for some time, as the matter of location is now in the courts. J. R. C. Brown is Ch. Engr. Bd. Pub. Serv.

GALION, OHIO.—We are officially advised that bids were received on Oct. 19 as follows by the Board of Public Service for constructing about three miles of trunk line sewer: A. J. Stough, Galion, $27,887; P. Drake & Sons, Marion, Ohio, $22,384; J. Murphy & Co., Marion, $24,454; U. S. Construction Co., Columbus, Ohio, $23,389; H. J. Glover, Lorain, Ohio, $22,026; H. W. Mathews, Lorain, $23,440; L. P. Butterfield, Bucyrus, Ohio, $26,933; Stratton & Applegate, Alliance, Ohio, $31,111; Price & Hurley, Marion, $22,537. Bradbury & Shute, Engrs., Columbus, Ohio. Itemized bids will be given under Contract Prices next week.

DAYTON, OHIO.—SHAFOR & DILL were awarded the contract on Oct. 14 by the Board of Public Service for the construction of a storm water sewer in North Bend Ave., and a sanitary sewer in Webster St., at $9,184. This work is in connection with the North Dayton pumping station. William Budroe is Clk. Bd.

INDIANAPOLIS, IND.—Bids are asked until Oct. 30 by the city for constructing the Brightwood main sewer. Length, three miles, varying in size from 2 ft., 6 ins., to 10 ft., concrete or brick. Estimated cost, $190,000. Charles A. Brown is Asst. City Engr.

HILLSDALE, MICH.—The contract for constructing pipe sewers, bids opened Oct. 13, has been awarded by the Board of Public Works, to SHOECRAFT & SWOUK, of Coldwater, Mich., at $4,590.

MOLINE, ILL.—C. J. Anderson, City Engr., is preparing plans for about five miles of 6, 8, 10, 12 and 15-in. pipe sewers, to be constructed in the Sixth Ward. Bids will be received next spring.

CHICAGO, ILL.—The Board of Local Improvements on Oct. 22 awarded the contract to JOHN W. FARLEY, Chicago, for the construction of the Western Ave. sewer to relieve Gage Park at $427,609.

MARSHALL, ILL.—It is proposed to construct a sewer on the east side. Estimated cost, $20,000. J. R. Poge is Engr. J. W. Lewis is Chn. Bd. Local Improvements.

CAIRO, ILL.—The Board of Local Improvements has awarded contracts as follows: Vitrified tile pipe sewers in 30th St., and 31st St., to the CITY CONSTRUCTION CO., at $3,549 and $3,551, respectively. Ernest Nordman is Secy. Bd.

NORTHWOOD, IOWA.—Bids will be received by Iver Iverson, Jr., Audr., Worth County, until 1 p. m., Nov. 11, for the tile drains and a drainage ditch.

SPENCER, IOWA.—Bids will be received by the city until 8 p. m., Nov. 6, for the construction of a vitrified pipe sewer in Main St. R. L. Taylor is City Clk.

CLINTON, IOWA.—R. C. Hart, City Engr., has completed plans for one mile of 8, 10 and 12-in. sanitary tile sewers.

JEFFERSON CITY, MO.—Bids will be received by the City Council until 4 p. m., Nov. 2, for the construction of sewers in Subdivision "A" of sewer district No. 8. E. F. C. Harding is City Engr.

VERNON, TEX.—The city has voted $10,000 of bonds for the construction of a sewer system. L. P. Bonner is Mayor.

MUSKOGEE, OKLA.—The city has voted $200,000 of bonds for the construction of trunk lines of storm sewers. T. H. Martin is Mayor.

OKLAHOMA CITY, OKLA.—BOUSE & BOUSE were awarded the contract on Oct. 19 by the city for the installation of a sewerage system in the Ornedale addition at about $10,377. Other bidders were: H. B. Derr, $11,800; J. W. Stotkes, $12,900; Parker-Washington Co., $12,795; J. O. Sevens, $13,630. W. C. Burke is City Engr.

MOUNT VERNON, WASH.—Bids will be received by the city until Nov. 4 for the construction of a sewer system in various streets.

SAN DIEGO, CAL.—Bids are asked until Nov. 7 by the Board of Public Works, for constructing the University Heights sewer. Estimated cost, about $120,000. A. F. Crowell is City Engr.

SAN FRANCISCO, CAL.—The Board of Public Works has awarded to the CITY STREET IMPROVEMENT CO., the contract for laying the new sewer along Fulton and Devisadero Sts., from Masonic Ave. to Grove St., at $24,938. Marsden Manson is City Engr.

STREETS AND ROADS.

(denotes that this work is advertised in Engineering News.)*

HARTFORD, CONN.—Contracts for the construction of State road work, bids for which were opened at the office of the State Highway Commissioner, on Oct. 19, have been awarded as follows: Town of Southbury, 2,300 lin. ft. of macadam-telford on the Oxford Road, to the LANE CONSTRUCTION CORPORATION, Meriden, at $209 per lin. ft. for macadam, $2.69 per lin. ft. for telford, 60 cts. per sq. yd. for cobblestone gutters. Other bidders were: O. T. Benedict, Pittsfield, Mass, $2.15; $2.65; 65 cts.; Pierson Engineering & Construction Co., Bristol, $2.20; $2.60; 60 cts.; B. N. Beard Co., Shelton, $2.30; $2.85; 45 cts.

Town of Vernon, 1,767 lin. ft. macadam on Union St., to LANE CONSTRUCTION CORPORATION, Meriden, Conn., at $2.24 per lin. ft. for macadam and 60 cts. per sq. yd. for cobble gutters. Other bidders were: O. T. Benedict, Pittsfield, $2.39 and 50 cts.; R. B. Davis, Hartford, $2.48 and 20 cts.; Amos Bridge's Sons, Hazardville, $2.79 and 30 cts.; Pierson Engineering & Construction Co., Bristol, $2.35 and 30 cts.; B. D. Pierce, Jr., Co., Bridgeport, $2.23 and 65 cts.

Town of Colchester, 1,600 lin. ft. gravel-telford on the Norwich road to the Selectmen, S. H. Kellogg, Chn., at $1.20 per lin. ft. ●

HARTFORD, CONN.—Bids are asked until 2 p. m., Nov. 2, by the State Highway Commissioners for the construction of state road work, as follows: Town of Horwinton, 2,000 lin. ft. grading, including retaining wall and one 15-in. tile culvert, 2,870 lin. ft. grading, including one 12-in. and one 18-in. tile culverts on River Road; town of Morris, 2,700 lin. ft. gravel, including one 12-in. and one 18-in. tile culverts on Bantam Lake Road; town of Sharon, 4,540 lin. ft. gravel—telford on Millerton Road; 1,540 lin. ft. grading, including three 20-in., one 18-in., one 12-in., and one 15-in. tile culverts on West Cornwall Road; 1,825 lin. ft. grading, including one 12-in. tile culvert on Duane Flat; 1,700 lin. ft. grading on Lakeville Road; 3,325 lin. ft. grading, including one 12-in., one 15-in., one 18-in., and one 24-in. tile culverts on Amenia and Sharon Roads.

All bids for road work in the town of Sharon have been rejected; the work will be readvertised.

HARTFORD, CONN.—The contract for the construction of about 12,865 lin. ft. of graded road, including 600 lin. ft. of rubble drain and five 20-in., and one 24-in. tile culverts in the town of Plainfield, bids for which were opened at the office of the State Highway Commissioner on Oct. 26, has been awarded, to the PIERSON ENGINEERING & CONSTRUCTION CO., of Bristol, Conn., at $14,-000 for grading and 40 cts. per lin. ft. for drain. Other bidders were: John F. Gill Co., Winter Hill Station, Boston, Mass., $18,-820 and 80 cts.; O. T. Benedict, Pittsfield, Mass., $13,990 and 75 cts.; Amos Bridge's Sons, Hazardville, $21,470 and 60 cts.; Ahern Bros., Norwich, $15,181 and 90 cts.; M. L. Trail, Groton, $16,093 and 30 cts.; C. W. Blakeslee & Sons, New Haven, $17,188; A. Vito, Thompson, $14,794.75 and $1.25; A. Brazos & Son, Middletown, $34,500 and $1.30; Connecticut Contracting Co., Hartford, $15,-129.75 and $1.25.

NEW YORK, N. Y.—Bids are asked by John W. Brannan, Pres. Bd. of Trustees, Bellevue and Allied Hospitals, until 3 p. m., Nov. 2, for all labor and material required for furnishing and setting wrought iron fence, granite fence posts and copings, sidewalk curbs, sidewalk paving and other work in connection therewith in front of Pavilion A, and the Pathological Department of the new Bellevue Hospital, situated on First Ave. and bounded by 26th and 29th Sts., Borough of Manhattan, City of New York.

NEW YORK, N. Y.—Bids are asked until 11 a. m., Nov. 9, by Louis F. Haffen, Pres. Boro. of The Bronx, for paving with asphalt pavement on a concrete foundation the roadways and sidewalks of the bridges over the New York, New Haven & Hartford R. R. (Harlem River Branch) at Wood Ave., Tiffany St., Hunts Point road, Faile St., Bryant St., Westchester Ave., Tremont Ave., West Farms Road, White Plains road, Unionport rond, Williamsbridge road and Baychester Ave., and at East 149th St., Leggett Ave., Lafayette Ave., Barretto St., Longfellow Ave. and Ludlow Ave.

PORT CHESTER, N. Y.—Bids were received on Oct. 19th for brick paving on (a) Broad St. and on (b) King St., as follows: J. O. MERRITT CO. (a) $10,891 (awarded contract). (b) $8,415. F. E. Murray (a) $11,027. (b) $8,554. R. S. Kirby is Village Engr.

NEW BRIGHTON (S. I.), N. Y.—Bids will be received until Nov. 10 by George Cromwell, Boro. Pres., St. George, New Brighton, for furnishing materials and regulating and repaving with vitrified brick pavement on a concrete foundation the gutters on portions of Harrison, Housman, Simonson and Pennsylvania Aves., 4,110 sq. yds., with iron slag block on a concrete foundation; portions of the roadways of Water St., Woodruff Lane and Barker St., 1,060 sq. yds.; and with wood block, on a concrete foundation, the roadway of Heberton Ave., from Post Ave. to Elizabeth St., 6,200 sq. yds.

ALBANY, N. Y.—Bids are asked by the Board of Contract and Supply until Nov. 2 for the improvement of Sherman St., from the east line of Northern Boulevard to the west line of Lark St., the work including grading, curbing and paving the carriageway with vitrified fire clay paving blocks, repairing and laying sidewalks with flags and vitrified blocks and building receiving basins. Isidore Wachsman is Clk. Bd.; Walter Mellus is City Engr.

YONKERS, N. Y.—Bids were received as follows on Oct. 19 by the Board of Contract and Supply for regulating and grading Palmer Ave., from Bronx River to Central Park Ave.: THOMAS GRADY, $10,900 (awarded contract); McDonald & Murray, $12,500; Molloy & Murray, $12,567; Fisher & Cuzzo, $12,900; O'Rourke Bros., $12,988; Fred. E. Gross, $13,000; Charlton & Weston, $14,370; M. J. Callahan, $15,000; Kelly & Hannifin, $15,960. John T. Geary is City Clk.

NEW YORK, N. Y.—The following bids were opened on Oct. 15 by the Park Board for paving with asphalt tiles certain walks of Central and other parks in the Borough of Manhattan: (a) 135,000 sq. ft. asphalt tile walk to be laid on a 2-in. sand bed; (b) 74,000 sq. ft. asphalt tile walk to be laid on a 6-in. sand bed; (c) totals: Barber Asphalt Paving Co., 30 Church St., (a) 24½ cts., (b) 27½ cts., (c) $53,425; Continental Asphalt Paving Co., 70 Wall St., (a) 24 cts., (b) 28¼ cts., (c) $53,305; Hastings Pavement Co., 25 Broad St., (a) 23½ cts., (b) 26½ cts., (c) $51,335.

PALISADES PARK, N. J.—The contract for improving Anderson Ave. has been awarded to JAMES J. FUSCO, 9 Clinton St., Newark, N. J., at $16,347.

CROSSWICKS, N. J.—Bids will be received by the Board of Chosen Freeholders of Burlington County, Joel Horner, Dir., until Nov. 9, for macadamizing Bridge St. a distance of 700 ft.

CAMDEN, N. J.—The Common Council has authorized the paving of Mount Ephraim Ave., from Spruce St. to Kaighn Ave., with Belgian blocks. Harry B. Salter is City Clk.

GLENFIELD, PA.—Bids are asked by the Borough Council until 7:30 p. m., Nov. 2, for laying sidewalks on the west side of Kilbuck St., from Beaver St. to School St., and on the east side of Kilbuck St., from School St. to the northerly borough line. Approximate amount, 11,600 sq. ft. Douglass & McKnight are Boro. Engrs.

PHILADELPHIA, PA.—George R. Stearns, Dir. Pub. Wks., awarded the contract to the FILBERT PAVING CO. on Oct. 20 for grading and paving with asphalt, to a width of 100 ft., Hunting Park Ave., from Wissahickon Ave. to Blabon St., at $22,500. The work is to be finished by the end of December.

McKEESPORT, PA.—Bids will be received at the office of the City Controller until 4 p. m., Nov. 3, for the following: Grading, curbing and paving with vitrified brick Erie St., from Atlantic Ave. to Monongahela River; also Perry St., from Atlantic Ave. to Pacific Ave., and Gross St., from Perry St. to Reed St.

SHARON, PA.—WILLIAM McINTYRE & SONS CO., of this city have been awarded the contract for paving East State and South Dock Sts., with vitrified fire brick and constructing several miles of improved state road between here and Greenville, Pa., including the construction of several bridges.

LEECHBURG, PA.—The contract for the construction of about one mile of county road near this city has been awarded to WILLIAM SHIRLEY, of Hillville, Pa. The road will be a cut-off between here and Hyde Park.

PHILLIPSBURG, PA.—CHARLES N. WAPLE, of this city, has been awarded the contract for the construction of the section of the Tyrone pike beginning at the city line. The road will be macadam, 14 ft. wide.

SCOTTDALE, PA.—The UNIONTOWN CONSTRUCTION CO., of Uniontown, Pa., has been awarded the contract for paving Spring St. with vitrified fire brick. The contract for the fire brick has been awarded to the HAMMOND FIRE BRICK CO., of Fairmont, W. Va.

Bids will be received by the Council until 8 p. m., Nov. 6, for grading, curbing and paving Arthur Ave. Bids will be made separate for either sandstone or concrete curbing and for either brick or block stone for paving.

BALTIMORE, MD.—The Commissioners for Opening Streets, James H. Smith, Pres., have recommended that the Board of Awards reject all bids for paving Fourth Ave., from Roland Ave. to Chestnut Ave. B. T. Fendall is City Engr.

PORTSMOUTH, VA.—The city has awarded the contract to LOUIS LARSON, Norfolk, Va., at $2.28 per sq. yd., for paving Middle St. with vitrified brick. Total, $37,728. Bascom Sykes is City Engr.

BEDFORD CITY, VA.—W. A. NANCE, of Bedford City, has been awarded the contract, at 89 cts. per sq. yd., for laying granolithic sidewalks, to be 5½ ft. wide and about ½-mile long, the street to be straightened and graded.

NEWPORT NEWS, VA.—Bids are asked until noon, Nov. 2, by Floyd A. Hudgins, City Clk., for supplying and setting curbing, both granite and concrete curb and gutter, and for grading and paving and for curbing, grading and paving such of the streets of the city as the Council may select. Bids are asked for paving with sheet asphalt, bitulithic, block asphalt, vitrified brick, granitoid concrete block pavement and macadam.

DECATUR, GA.—The city has voted $30,000 of bonds for street improvements.

SAVANNAH, GA.—J. T. HARRIS, of Savannah, has been awarded the contract for grading the center mall of Daffin Park at about $3,500.

SARASOTA, FLA.—The City Council has passed a bond ordinance providing $30,000 for improving streets and constructing a sewerage system.

GADSDEN, ALA.—The city has awarded the contract to CHARLES O. DUNCAN, of Gadsden, for paving the sidewalks on Chestnut St., at 87½ cts. for cement sidewalks and 90 cts. for driveways.

GREENWOOD, MISS.—The Board of Supervisors of LeFlore County have authorized the issuance of $100,000 of bonds for road construction.

NASHVILLE, TENN.—The city awarded the contract on Oct. 17 to JOHN BRODERICK & SON, of Nashville, for grading and macadamizing South Sixth St. and Crutcher St., at $8,889. W. W. Southgate is City Engr.

CHATTANOOGA, TENN.—The Southern Paving Construction Co., First National Bank Bldg., Chattanooga, has submitted the lowest bid to the Board of Public Works for paving McCallie Ave., districts Nos. 37 and 39, with asphalt, vitrified brick, limestone curbing, grading, etc., at about $7,500. H. F. Van Dusen is Chn. Bd.

*ASHLAND, KY.—Bids will be received by the City Clerk until 7.30 p. m., Nov. 9, for furnishing all materials and the construction of vitrified brick pavements, [illegible] and gutter and concrete [illegible] plans and specifications on [illegible] of the City Engineer. The [illegible] quantities are: 44,540 sq. [illegible] 21,000 lin. ft. combined curb [illegible] paving; necessary catch basins for [illegible] ft. concrete headers. Spe[illegible] blank forms of bids will be f[illegible] plication to J. Y. Bosley, City [illegible]

CINCINNATI, OHIO.—Bids [illegible] noon, Nov. 6 by the County [illegible] Fred. Dreihs, Clk., for the [illegible] the Cleves and Dugan Gap R[illegible] tance of 12,200 ft.; of Ra[illegible] and for the repair of the W[illegible]

The County Commissioners [illegible] awarded contracts as follows: [illegible] of Dawson Road, Miami Ave[illegible] Road, to W. TAULMAN, at $4[illegible] ment of Bittenhouse Road, Jam[illegible] ner to Stump's line, to FRAN[illegible] $3,650.

STEUBENVILLE, OHIO.—The [illegible] way Commissioner has awarded [illegible] for the construction of about [illegible] of state road between here [illegible] ville, Ohio, to JOHN L. MARTI[illegible] McDONALD, both of this pla[illegible] will be macadamized.

SPRINGFIELD, OHIO.—W. F[illegible] Springfield, has been awarded [illegible] by the Cleveland, Cincinnati, C[illegible] Louis Ry. Co., for paving the [illegible] around the new freight station of the company, at about $20,000.

YOUNGSTOWN, OHIO.—Bids [illegible] until noon, Oct. 30, by the Board Public Service for paving Regent St., betwe[illegible] Oak Hill Ave. and Hillman St. W. H. McMillin is Clk. Bd.

WABASH, IND.—Bids are asked by the Commissioners of Wabash County until Nov. 20, for the construction of a gravel road. J. P. Noftzger, County Audr.

BLOOMFIELD, IND.—Bids are asked by the Commissioners of Greene County until Nov. 14 for the construction of a gravel road in Richland Township. Peter Cook is County Audr.

COVINGTON, IND.—Bids are asked by the Commissioners of Fountain County until Nov. 14 for the construction of two separate gravel roads designated as gravel road Nos. 1 and 2 in Van Buren Township. William B. Gray is County Audr.

SOUTH BEND, IND.—Bids will be received until 10 a. m., Nov. 10, for grading and paving with brick the first alley north of Division St.; first alley north of Salem St., and for grading Terrace Ave. and Leland Ave. W. A. McInery is Chn. Bd. of Pub. Wks.

BLOOMINGTON, ILL.—Bids are asked until 2 p. m., Nov. 1, by the Board of Local Improvements for a vitrified brick pavement and Portland cement concrete curbing on Catherine St. from the north line of Chestnut St. to the south line of the alley extending east from Catherine St. between Chestnut and Walnut Sts. E. H. Packard is Clk. Bd.

EAST ST. LOUIS, ILL.—Bids will be received until noon, Oct. 31, by the Board of Local Improvement, Frank B. Hanna, Clk., for furnishing material, grading, draining and paving with brick portions of 26th St., requiring 1,240 cu. yds. of earth fill in excess of excavation, 5,790 lin. ft. 5 x 20-in. sandstone curb, 10,882 sq. yds. of vitrified brick pavement, 240 lin. ft. 15-in. vitrified clay drain pipe.

ROCKFORD, ILL.—Bids were received as follows on Oct. 15 by the city for paving East and West State and South Main Sts: Standard Paving Co., 34 South Clark St., Chicago, Ill., east side, $12,524; west side, $37,410. Capital City Concrete Co., Springfield, Ill., east side, $12,773; west side, $38,200. Barber Asphalt Co., 108 La Salle St., Chicago, east side, $13,803; west side, $41,324. S. B. Hand is City Engr.

DUBUQUE, IOWA.—Bids will be received at the Council Chamber, City Hall, by the City Recorder, until 8 p. m., Nov. 5, for the improvement of various streets by laying cement sidewalks on an 8-in. foundation of cinders in accordance with the plans and specifications on file in the office of the City Recorder.

KIRKSVILLE, MO.—Bids will be received until Nov. 2 by the City Council for 6,450 sq. yds. of vitrified brick pavement and 5,100 lin. ft. of combined curb and gutter. H. Selby is Mayor.

ST. LOUIS, MO.—Contracts were awarded by the Board of Public Improvements on Oct. 16 as follows: To GRANITE BITUMINOUS PAVING CO., of St. Louis, for paving Penrose St., $26,488; Red Bud Ave., $22,106; Shawmut Pl., $23,061; Temple Pl., $11,193; Ridge Ave., $1,727; Lawrence St., $31,943. W. B. Dryden is Secy. Bd. of Pub. Improvements.

ST. LOUIS, MO.—Bids will be received until noon, Nov. 6, by the Board of Public Improvements for constructing sidewalks on portions of several streets. Estimated cost, about $9,750.

Bids will be received until noon, Nov. 13, by the Board of Public Improvements for improving portions of numerous alleys by paving with vitrified brick block. Estimated cost, $72,000.

GALVESTON, TEX.—Horton & Harris of Galveston, have submitted lowest bid to the city, at $15,926, for paving Market St. V. E. Austin is Comr. of Sts. and Pub. Property; A. T. Dickey is City Engr.

EL RENO, OKLA.—The city will soon ask bids for paving the principal residence streets with asphalt.

COLVILLE, WASH.—The only bid received by the State Board of Highway Commissioners for the construction of twelve miles of the proposed state road in Stevens County, that of Rusch & LaPlant, of Colville, at $11,000, has been rejected as in excess of the available fund.

SEATTLE, WASH.—Bids are asked until Oct. 31 by the Board of Public Works for paving [illegible] Ave. N. E., and other streets. Estimated cost, $81,300. Approximate quantities on file at office of Engineering News, [illegible] work.

ASTORIA, ORE.—The Street Committee has opened bids for the improvement of 46th St. as follows: Birch & Jacobsen, $4,985; C. G. Becker, Hamberg, $5,342; LEANDER LEBECK, [illegible] (awarded contract).

LOS ANGELES, CAL.—The Board of Public Works on Oct. 14 awarded the contract for paving 27th St. with Main St., from Jefferson to GILMORE & WILTON CO., Los Angeles, at $1[illegible]. Homer Hamlin is City Engr.

MANUFACTURING PLANTS.

(denotes that this work is advertised in Engineering News.)*

SPRINGFIELD, MASS.—George B. Allen, Mill [illegible], of Hartford Conn., is preparing plans for a factory to be erected in Springfield. It will consist of a factory four stories high, 300 ft.; a power-house, 50 × 60 ft., [illegible] concrete coal pockets. There will be steam [illegible], freight elevators, two 125 HP. boilers, [illegible] roofing.

TORRINGTON, CONN.—The contract has been awarded to PECK, McWILLIAMS & [illegible] for the erection of a new factory for the [illegible] Paper Co. It will be three stories high, 120 × 40 ft., of mill construction, with a gravel roof.

NEW BRITAIN, CONN.—Plans have been completed by the Hart & Cooley Co., of New Britain, manufacturers of steel floor registers and lockers, for a 3-story brick structure, 50 × 57 ft., and a 1-story washroom, 16 × 38 ft.

SOUTH FARMS, CONN.—The Russell Mfg. Co. will erect a mill, of brick construction, 110 × 50 ft., at South Farms. About 100 new looms will be installed in the mill as soon as it is completed.

HARTFORD CONN.—The McCue Co., manufacturers of carriage hardware, has had plans drawn for a new plant on Garden St. The main factory will be a 2-story brick structure, 47 × 202 ft. There will be a 1-story blacksmith shop, 50 ft. long, and a garage one story high, 27 × 42 ft.

ESSEX, CONN.—Contract was awarded by the Tiley, Pratt Co. for the steel work on its new factory to the BERLIN CONSTRUCTION CO., Berlin, Conn., and not to the Berlin Iron Bridge Co., as noted last week.

BRIDGEPORT, CONN.—The American & British Mfg. Co., of Bridgeport, makers of artillery, ammunition and lathes, will make immediate improvements. One factory, 40 × 185 ft., will be carried up an extra story, and a brick store room, 53 × 155 ft. will be erected.

The factory building which the McFarlane Bros'. Mfg. Co., of Bridgeport, makers of specialties, is to erect, will be three stories high, of brick, 30 × 112 ft.

ORANGE, CONN.—The Narrow Fabric Corporation, manufacturers of elastic garter webbing, has filed notice of an increase in capital stock from $75,000 to $100,000, the proceeds derived to be applied to improvements.

MOOSUP, CONN.—The Aldrich Mfg. Co. will erect a 500-loom extension soon, it is reported.

COXSACKIE, N. Y.—The Copper Roller-Bearing Trolley Wheel Co., of New York, N. Y., will construct a plant here for the manufacture of copper, brass and bronze materials. Capital, $100,000.

MANCHESTER, N. Y.—The Lehigh Valley R. R. Co. yards at Manchester, according to reports, will be enlarged to accommodate 1,400 cars. A $40,000 machine shop will be erected, and the total improvements will cost $100,000. Walter G. Berg, New York, is Ch. Engr.

ALBANY, N. Y.—The Northern Asphalt Co. will erect a factory on Seventh Ave., Albany, to replace the one recently destroyed by fire.

PHILADELPHIA, PA.—The Yorkshire Worsted Mills are reported to have been purchased by Miller & Pleet. The new owners contemplate making improvements. The dye-house is to be enlarged, a new set of boilers, from 350 to 400 HP. installed and a storage warehouse, 60 × 120 ft., erected.

Ballinger & Perrot have completed plans for a 5-story brick factory, 62 × 65 ft., to be built at 110 North 23d St., for the George P. Pilling & Son Co.

BEAVER FALLS, PA.—The Ingram-Richardson Mfg. Co., of this city, has awarded the PENN BRIDGE CO., of Beaver Falls, the contract for the structural material and erection of the new addition to the plant here, and to MARTSOLF BROS., New Brighton, Pa., the contract for the brick and concrete work, excavation and installing equipment for the new addition that is to be built to its manufacturing plant. The addition will be two stories in height, 75 × 120 ft. Work will be started next month.

UNIVERSAL (East Pittsburg post-office), PA.—Plans have been prepared by the Universal Portland Cement Co., a subsidiary of the U. S. Steel Corporation, to double the capacity of its slag cement plant at Universal, Pa., at a cost of about $2,000,000. The plans provide for an additional capacity of 5,500 bbls., making the total capacity of the plant when complete of 10,0000 bbls. a day.

BOULEVARD, VA.—George H. Brown, Factory Supt. of the Virginia Land & Improvement Co., Boulevard, advises us that the company is constructing a sawmill to cut lumber for its proposed veneer barrel stake factory. Two 50-HP. boilers will be installed.

MEARS, VA.—A. F. Mears will establish a planing factory in the spring. He will install a dynamo for electric lights, using a 150-HP. boiler with two engines, and will erect sawmill in connection.

BUCHANAN, VA.—O. C. Huffman, Pres. Virginia Can Co., has, it is reported, purchased a site and will erect a can factory of 500,000 cans daily capacity. The plant is to cost $100,000.

FAIRMONT, W. VA.—A contract has been let to the CANTON BRIDGE CO. to erect a chemical plant which will cost about $125,000.

SALISBURY, N. C.—The Vance Cotton Mills, of Salisbury, N. C., will provide improvements for its plant. A 40 × 50-ft. addition will be erected, the building and machinery to involve the expenditure of from $10,000 to $12,000. The Vance company manufactures cotton yarns and warps.

BENNETTSVILLE, S. C.—T. B. McLaurin, of Bennettsville, will erect a cotton towel factory here, it is stated.

VALDOSTA, GA.—W. Y. WEISENBAKER & CO. have the contract, it is stated, to erect the building for an ice plant here. Cost, $8,000.

ST. AUGUSTINE, FLA.—The Solla-Martinez-Carcaba Co. will establish a cigar factory in St. Augustine. The building will be partly heated by steam and equipped with electric lights; contract for construction to be awarded soon. Fred Hendricks, St. Augustine, is Arch. The factory will be a brick structure, three stories and basement, with wood floors, doors and windows. Cost, about $15,000. Capacity of plant, 20,000 cigars daily.

GADSDEN, ALA.—The Louisville & Nashville Railroad, W. H. Courtney, Ch. Engr., Louisville, Ky., will, it is reported, erect repair shops in Gadsden, plans for which have been prepared.

MONTGOMERY, ALA.—The Howler Mfg. Co., of Montgomery, will erect a building to cost $50,000.

MERIDEN, MISS.—Armour & Co., of Chicago, Ill., are preparing to build here repair and railroad shops. The estimated cost is $100,000.

ASHLAND, KY.—The Wright-Saulsberry Lumber Co. has about completed arrangements for rebuilding its burned plant. The main building will be 140 × 42 ft., equipped with 8-ft. single-band mill, 12-in. saws with equipment to cut timbers of 45 ft. Capacity about 50,000 ft. daily. Contract for machinery has been awarded to ALLIS-CHALMERS CO., Milwaukee, Wis.

BLOOMINGTON, IND.—The Gary Steel Co. has purchased a tract of land near this city upon which to build a steel mill to cost $1,000,000.

ZION CITY, ILL.—It is stated that Marshall Field & Co., of Chicago, are planning to enlarge the Zion City lace works at a cost of $50,000.

SPRINGFIELD, ILL.—The contract has been awarded to the CULVER CONSTRUCTION CO. to construct the Fetzer implement factory. The plumbing contract has been let to the WALZ HEATING & PLUMBING CO. The building will be 240 × 340 ft., with a saw-tooth roof and will cost $44,475. William Fetzer is Pres.; George H. Helmle is Arch.

CHICAGO, ILL.—We are officially advised that Louis F. Nonnest, 254 North Green St., will build a 7-story furniture factory, 160 × 220 ft., at Hooker and North Halsted Sts. It will be brick mill construction.

We are officially informed that Hallberg & Co., Archs., 84 La Salle St., are preparing plans for an office and printing plant for Rogers & Co., 521 Wabash Ave. It will be of reinforced concrete, three stories high, 120 × 100 ft. Preliminary plans are being prepared. Stewart Hodges, 84 La Salle St., is Engr.

We are advised that a permit has been granted to M. J. Neahr & Co., 89 South Clinton St., to construct a 4-story warehouse and bag factory, 135 × 140 ft., at 1600 Dearborn St. The structure will be of steel, brick and concrete construction and a vault and elevator will be needed. John Van Osdel, 225 Dearborn St., is Arch. and Engr. Cost, $90,000.

The Schulze Baking Co. has purchased a site at Harrison St. and Francisco Ave. and will erect an extension to its plant, the structure to be 100 × 230 ft., of brick and stone and to cost $50,000.

DES MOINES, IA.—Plans have been completed for the railroad shops, to be constructed of brick and steel, for the St. Paul & Des Moines Ry. Co. Fred P. MacMillan, of Des Moines, Gen. Mgr.

KANSAS CITY, MO.—Samuel A. Walker, Jr., and Marshal S. Walker, of Grand Rapids, Mich., propose to establish a plant at Kansas City, Mo., to be known as the Kansas City Knitting Mills.

ST. LOUIS, MO.—The Manewal Bread Co., George Manewal, Pres., will expend $10,000 in alterations and improvements to building recently purchased. The company will install baking machinery to cost $5,000.

The American Car & Foundry Co. will erect a factory building to cost nearly $200,000. The new buildings will be located at 2301 South First St. One structure will cost $90,000 and another $78,000. They will be one story high. Construction will begin at once.

TULSA, OKLA.—The Lippincott Glass Co., Alexandria, Ind., will establish a glass plant in Tulsa. Estimated cost of building, $60,000.

BLAINE, WASH.—J. W. Stout will lay the foundation for a combination saw and shingle mill soon. It will be located on the site of the former mill owned by Lester W. David and destroyed by fire a few months ago. The shingle mill will be equipped with seven upright machines, capable of cutting 210,000 shingles daily. Later a sawmill will be added that will cut an average of 40,000 ft. of lumber daily.

SEATTLE, WASH.—The Canal Mfg. Co., 343 West Blewitt St., is perfecting plans for enlarging its plant. The company will take up the manufacture of moulding besides its other work.

PORTLAND, ORE.—Lewis & Lewis, Archs., are preparing plans for a 2-story brick building, 50 × 100 ft., to be erected on East Sixth St., between East Couch and East Davis Sts. It will be occupied as a candy factory by F. A. Harradon & Co.

ROSEVILLE, CAL.—The Southern Pacific R. R. Co. has in contemplation the erection of two plants for the pre-cooling fruit and vegetables. It is proposed to erect a plant at Roseville capable of chilling 20 carloads in four hours and one in Colton capable of chilling 40 carloads in four hours. W. Hood is Ch. Engr., San Francisco, Cal.

VANCOUVER, B. C.—The erection of a large sawmill on False Creek, near the south end of the new Granville St. Bridge, is planned by John Hanbury, of Bandon, Man., Pres. of the Hanbury Mfg. Co., which owns mills in Bandon and the Kootenays.

VICTORIA, B. C.—Final arrangements have been made for the completion in this city of the New Porto Rico mill on the C. P. R. flats between the C. P. R. wharf and the Launch Club. Arrangements have been made to drive the necessary piles at once on the site, and A. McPherson will superintend the work. It is proposed that the mill itself shall be built on piles and that it shall have a capacity of about 45,000 ft. daily.

MISCELLANEOUS CONTRACTS.

(denotes that this work is advertised in Engineering News.)*

U. S. RECLAMATION SERVICE.—All news relative to canal projects, etc., will be found under Water Supply—Irrigation.

*CHANNEL, ETC.—Chicago, Ill.—See under Bridges.

CULVERT.—Lincoln, Neb.—Bids are asked until Nov. 2 by W. L. Dawson, County Clk., for constructing a reinforced concrete culvert on O St.

WHARF.—St. John, N. B.—D. C. CLARKE of St. John, has been awarded contract for new government wharf in Rodney slip, at about $280,000.

DOCK.—St. Johns Ore.—Contract for building new Philadelphia St. city dock has been awarded by the City Council to JOSEPH PAQUETT, at $32,299.

DREDGING.—Vancouver, B. C.—Bids are asked until 4.30 p. m., Oct. 30, by the Department of Public Works, Ottawa, Ont., for dredging Coal Harbor, Vancouver.

WHARF.—Berkeley, Cal.—Contract for improving wharf has been let by the Town Trustees to the MERVEY-ELWELL CO., Oakland, Cal., at $21.25 per lin. ft.

WHARF.—Cap St. Ignace, Que.—Bids are asked by the department of Public Works, Ottawa, Ont., until 4.30 p. m., Nov. 13, for constructing wharf at Cap St. Ignace, Que.

BREAKWATER.—Blue Rocks, N. C.—Bids are asked by the Department of Public Works, Ottawa, until 4.30 p. m., Nov. 6, for construction of breakwater at Blue Rocks.

DITCH.—Eldora, Iowa.—Bids are asked until 1:30 p. m., Nov. 9, by R. A. Vigars, County Auditor, for constructing ditch and drain, aggregating 209,654 cu. yds. of open work. Drainage Dist. No. 3.

FREIGHT BOAT.—Toledo, Ohio.—The Toledo Shipbuilding Co. has let contract to RUFUS P. RANNEY, of Cleveland, for a $300,000 freighter to be delivered in the spring.

TRENT CANAL.—Ottawa, Ont.—Bids are asked by the Department of Railways and Canals until 4 p. m., Nov. 17, for construction of the Lindsay section of the Trent Canal.

DIKE.—Fort Wayne, Ind.—L. H. McAFEE, of Fort Wayne, has contract for repairing the Lakeside dike at $6,999; extra filling, 40 cts. per cu. yd.; extra concrete, $6 per cu. yd.; valves, $52.

WHARF.—Fort DeSoto, Fla.—Bids will be received until Nov. 7 by the Constructing Quartermaster, Fort Dade, Fla. (Palmetto post-office), for repairs to Quartermaster's wharf at Fort DeSoto.

DITCH.—Fowler, Ind.—C. B. Whicker, Drainage Comr., has awarded contract to TEMPLETON & HAMILTON, Morocco, Ind., at $8,795, for constructing the Brown ditch; estimated quantity, 113,000 yds.

GROYNES.—Port Stanley, Ont.—Bids will be received until 4.30 p. m., Nov. 5 by Department of Public Works, Ottawa, Ont., for constructing six groynes for shore protection at Port Stanley. Nap. Tessier, Secy.

LEVEES, ETC.—Velasco, Tex.—Bids will be received until Nov. 10, by R. E. L. Stringfellow, Chn. Board of Drainage Comrs., at the office of E. P. Hoefle, Velasco, for constructing levees, revetment work, ditches, etc.

HOSE.—Washington, D. C.—Bids are asked by the District Commissioners until noon, Nov. 4, for furnishing the fire department with 15,000 ft., more or less, of cotton, rubber-lined, and rubber fire hose, 2½-in. inside diameter.

WHARVES.—St. John, N. B.—Bids will be received by Nap. Tessier, Secy. Dept. of Public Works, Ottawa, until Nov. 12, for the construction of nine wharves and landing stages on the Grand Lake in Quebec County, N. B.

*RAILWAY DRY-DOCK.—St. Louis, Mo.—Bids will be received by the Mississippi River Commission until noon, Nov. 28, for constructing side haul railway dry-dock. Capt. G. R. Lukesh, Corsp Engrs., U. S. A., Secy. Comn.

MACHINERY.—Tompkinsville, N. Y.—Bids are asked until 1 p. m., Nov. 10, by the Light-House Engineer, Tompkinsville, for furnishing and installing machinery in the new lamp shop at the light-house depot, Tompkinsville.

DRAINING, FILLING.—New Brunswick, N. J.—Bids are asked by John B. Smith, Executive Officer, State Experiment Station Bldg., until 10 a. m., Nov. 2, for ditching, draining and filling Salt marsh areas in Dover Township.

CABLE.—Youngstown, Ohio.—The Safety Board has awarded the contract for the underground wiring of the police and fire signal system to the WESTERN ELECTRIC CO., of Pittsburg. The contract calls for 19,479 ft. of cable.

DITCH.—Newcastle, Ind.—The PORTLAND TILE CO., Portland, Ind., has received the contract, at $3,160, for the construction of the Jesse O. Mendenhall ditch, containing about two miles of tile. Nathan Nicholson, Drainage Comr.

WHARF.—Algoma, Ont.—Bids are asked until 4.30 p. m., Nov. 16, by Nap. Tessier, Secy., Dept. Public Works, Ottawa, for construction of an extension to the wharf at Providence Bay, in the Township of Canaryon, Manitoulin Island, Algoma, Ont.

DITCH.—Northwood, Iowa.—Bids will be received until 1 p. m., Nov. 11, by Iver Iverson, Jr., County Auditor, for constructing drainage ditch and tile drains, the work including 74,110 cu. yds. excavation in ditch, and 27,941 lin. ft. of 6, 8, 10, 12 and 15-in. tile.

WHARF AND SHED.—Mobile, Ala.—Bids were received on Oct. 2 by the Light-House Engineer, Mobile, Ala., for a buoy wharf and depot shed at Fort San Jacinto, Galveston Harbor, Tex. Contract was let to CHARLES FUNK, Galveston, Tex., at $6,-950.

CONCRETE WALL.—Washington, D. C.—Bids are asked by the District Commissioners, H. B. F. Macfarland, Chn., until noon Oct. 31, for building a concrete retaining wall in Eleventh St., S. E., along the west side of the north approach to the new Ansonia bridge.

OLD MATERIALS.—Jeffersonville, Ind.—Bids are asked until 10 a. m., Nov. 16, by Geo. Ruhlen, A. Q.-M. G., U. S. A., for the sale of obsolete and surplus stores, consisting of brass, cuttings, iron pipe, scrap iron and leather, horse shoes and miscellaneous supplies.

DRAIN.—Galveston, Tex.—Bids were received on Oct. 8 by the Board of City Commissioners for constructing extension of reinforced concrete drain on 19th St.. Contract has been awarded to KELSO & VANTRAM, of Galveston, at $18,406. A. T. Dickey is City Engr.

EARTHWORK.—New Orleans, La.—Bids are asked until 11 a. m., Oct. 31, by Capt. H. Burgess, Corps Engrs., U. S. A., Mississippi River Commission, Fourth District, 3238 St. Charles Ave., for constructing about 37,000 cu. yds. of earthwork in the Lake Borgne levee district.

LEVEE WORK.—Memphis, Tenn.—Bids were received on Oct. 19 for levee work; 276,000 cu. yds. enlargement work and 769,-500 cu. yds. new levee. B. J. Covington, 199 Randolph Bldg., Memphis, is Engr. Contract was awarded to ROACH & STANSELL, Memphis, at $275,310.

SALE OF TUG.—Boston, Mass.—Bids are asked by Maj. Thomas Cruse, Depot Q. M., U. S. A., 263 Summer St., until 11 a. m., Nov. 7, for the sale of the Q. M. department tug "Captain Reilly," which can be seen at Commercial Wharf, Boston. Terms cash in U. S. currency on day of sale.

PIER.—San Francisco, Cal.—Bids will be received at the office of the Board of State Harbor Commissioners, W. B. Thorpe, Secy., until Nov. 19, for furnishing material and constructing pier, and shed over same, to-be known as Pier 38, on water front at foot of First and Townsend Sts. Ralph Barker, Asst. Engr.

ENAMELED BRICK.—Atlanta, Ga.—Bids are asked until 10 a. m., Nov. 12, by R. V. LaDow, Supt. Prisons and Prisoners, Dept. Justice, Washington, D. C., for furnishing and delivering at the U. S. Penitentiary, Atlanta, Ga., 60,000 enameled stretcher bricks, of standard size, in accordance with specifications.

DAM.—Dayton, Ohio.—Bids were received on Oct. 2 by the Board of Public Service for the construction of the Riverdale dam, northern part of city. Bids for this work were to be received on Sept. 12 but no bids were submitted. Chris. Poock, $15,331; T. J. Backus Construction Co., $29,540; David Onkst, $21,833.

TANKS, PIPE COVERING.—Washington, D. C.—Bids are asked by Bernard R. Green, Supt. Const., Building for National Museum, until 2 p. m., Nov. 5, for furnishing and delivering the pressure, feed heater, blow-off and oil tanks, one of each, and for the non-conducting pipe covering required for the new building for the National Museum.

OIL ENGINES.—Milwaukee, Wis.—Bids for furnishing two kerosene oil engines with air compressor for the fog signal at the Grand Pointe au Sable, Mich., Light Station were opened on Oct. 8 by the Light-House Engineer, Milwaukee, as follows: FAIRBANKS, MORSE & CO., Chicago, Ill., $3,-030 (accepted); August Mietz, New York, $3,800.

DRY-DOCK.—Buffalo, N. Y.—The contract for building a large dry-dock at Buffalo has been let by the American Shipbuilding Co., of Cleveland, to the GREAT LAKES DREDGE & DOCK CO., of Chicago. The new dock will occupy the site of two of the small docks now being operated by the Buffalo Drydock Co. It will be 615 ft. long and 110 ft. wide.

MARBLE COLUMN SHAFTS.—Washington, D. C.—Bids are asked until 2 p. m., Nov. 11, by Bernard R. Green, Supt. Construction, Building for National Museum, Library of Congress, Washington, D. C., for furnishing and delivering "Breccia Stazzima" marble column shafts required for the screens in the rotunda of the new building for the National Museum.

LEVEE.—Sacramento, Cal.—Bids were received on Oct. 5 by M. J. Desmond, City Clk., for improving portions of B St. levee and Brighton levee. (This is a postponement from Sept. 7. Noted on Sept. 3.)

Geo. N. Randle, Sacramento, is City Engr. M. J. Desmond, City Clk The bidders were: Bayles & Kemper, 85 cts. a cu. yd.; the Summit Construction Co., 94 cts.

STEAM COLLIER.—Washington, D. C.—Bids are asked until noon, Dec. 15, by V. H. Metcalf, Secy. Navy Dept., for constructing, by contract, one steam collier (fleet collier No. 4, Cyclops). Circular defining chief characteristics of such vessel and outline type plans are now ready for distribution among prospective bidders. Forms of proposal and contract may be had on application to the department after Nov. 15.

SMELTING WORKS.—Chicago, Ill.—The general building contract has been let to H. EILENBERGER & CO., 153 La Salle St., Chicago, for smelting and refining works for the Great Western Smelting and Refining Co., 175 West Kinzie St., Chicago. Webster Tomlinson, Steinway Hall, Chicago, is Arch. and Engr. Estimated cost of building, which will be 140 × 410 ft., is $90,000. Cranes, scales, furnaces, etc., will be required.

LEVEE.—Greenville, Miss.—At a special meeting of the Board of Mississippi Levee Commissioners, contracts were awarded to R. L. LEONARD, of Memphis, Tenn., for 160,000 cu. yds. of levee work.

Contract for construction of 45,000 cu. yds. of levee work at Gunnison, Miss., has been awarded to ROACH & STANSELL, of Memphis. The letting was held on Oct. 1 by the Board of Mississippi Commissioners, at Greenville.

MOORINGS, BUOYS.—Tompkinsville, N. Y.—Bids are asked by the Light-House Inspector, Tompkinsville, until 2 p. m., Nov. 5, for furnishing and delivering moorings for vessels and buoys of the Light-House Establishment for the fiscal year ending June 30, 1909. The articles to be furnished embrace chain for light vessels, chain for buoys, mushroom anchors, bridle chains, swivels for light vessels, chain for vessel and buoy shackles and buoy swivels.

LEVEE.—Vicksburg, Miss.—Bids were received as follows on Oct. 14 by Capt. Clarke S. Smith, Corps Engrs., U. S. A., Vicksburg, for about 78,000 cu. yds. of levee work in Spirit Lake outlet, Red River, Ark. (price given per cu. yd.): W. R. Cavett, Box 312, Shreveport, La., 18¼ cts.; Hall Nattin, Box 380, Shreveport, 17.74 cts.; O. E. Gammill, Shreveport, La., 19.3 cts.; Hanson & Hanson, Lewisville, Ark., 18 cts., and W. H. North, Dixie, La., 24.2 cts.

METAL WORK.—Milwaukee, Wis.—Bids were received on Oct. 12 by the Light-House Engineer, Milwaukee, Wis., for furnishing cast metal, structural metal and terra cotta work for the White Shoal, Mich., Light Station. Contracts have been awarded as follows: Structural metal work, MILWAUKEE BRIDGE CO., Milwaukee, Wis., $12,538; cast metal, The ATLANTA MACHINE WORKS, Atlanta, Ga., $8,156; terra cotta work, the ATLANTIC TERRA COTTA CO., 1170 Broadway, New York, $8,200.

BARGE CANAL.—Albany, N. Y.—F. C. Stevens, Supt. Public Works, has awarded to ARTHUR McMULLEN, Park Row Bldg., New York, Barge Canal Contract No. 55, at $905,347. This contract is for constructing a reservoir dam on the Mohawk River at Delta, relocating a portion of the Black River Canal, building four locks and performing incidental work, area of reservoir inside of clearing line being 4.8 sq. mil·s. The engineer's estimate was $1,014,525. Bids were received on Oct. 1. Itemized prices were given in issue of Oct. 8.

DITCH.—Crookston, Minn.—Bids were received on Oct. 21 for constructing an 11-mile county ditch in southern end of Polk County. O. J. Hamery, Crookston, Engr. Estimated quantity, 197,400 cu. yds. The bids were as follows: Valley Dredging Co., 9.95 cts. per cu. yd.; R. A. Elzy & Co., 12.75 cts.; Horton & Mosley, 11.45 cts.; Foley & Gleason, St. Paul, 8 cts.; Northwestern Drainage Co., 12.95 cts.; France Dredge & Construction Co., 12.3 cts.; Harvey B. Smith, 12.4 cts.; Henry Wilder, 12.94 cts.; North Branch Ditching Co., 9.98 cts.

LEVEE.—New Orleans, La.—The Pontchartrain Levee Board has awarded contracts for levee work (bids received on Oct. 12) as follows: Bagatelle Levee, St. James Parish, 22,000 cu. yds., to A. E. PARKER, Vicksburg, Miss., 25.9 cts. per cu. yd.; Longview Levee, St. James Parish, 24,000 cu. yds., to BABBITT & CO., Baton Rouge, La., 23.9 cts., and Corniand Levee, St. John Parish, 25,000 cu. yds., to C. A. KELLER, 21.72 cts. For building the Gypsy Levee, in St. Charles Parish, 105,000 cu. yds., the bid of M. M. Elkins was the lowest, but owing to a want of some information the award was not made pending further investigation.

*DREDGING, EXCAVATION. — Chicago, Ill.—Bids were received on Oct. 14 by Col. M. H. Bixby, Corps Engrs., U. S. A., for dredging and rock excavation in Chicago River, Ill. The lowest bid submitted was that of the Great Lakes Dredge & Dock Co., Chamber of Commerce Bldg., Chicago, as follows: 52,000 cu. yds. dredging South Fork, South Branch, Chicago River, at 33 cts. per cu. yd., scow measurement; 12,900 cu. yds. rock excavation, South Fork, South Branch, Chicago River, at $4.25 per cu. yd., place measurement, and for dredging North River Branch, Chicago River (about $91,000 worth), at 16 cts. per cu. yd. scow measure.

REPAIRING WHARF, ETC.—San Francisco, Cal.—The Board of Harbor Commissioners has awarded the contract for repair work to a contracting firm instead of continuing the prevailing method of having repairs made by employes of the State. The change was decided after Ralph Barker, Ch. Engr., submitted the cost of pile-driving, repairing wharfs, bulwarks and ferry slips. Under prevailing methods the cost was for the year ending July 1, 1908, $48,410, while the same work is offered by contract for $36,741, a gain of $11,670, including all piles, caps, stringers, planking and all work and material required. The contract was awarded to the THOMSON BRIDGE CO., 103 Main St., San Francisco.

STEAMER.—Albany, N. Y.—The Hudson River Day Line, proprietors of the line of Hudson River passenger boats plying between Albany and New York, are planning the construction of a large steamer to take the place of the steamer "New York," which was burned last week. William B. Elmendorf, Albany, is Mgr. of the company.

CABLE.—Washington, D. C.—The following awards have been made for furnishing cable for the Signal Corps, U. S. A., bids for which were opened on Oct. 7: WESTERN ELECTRIC CO., New York, $31,000 ft., type 401, cable at $2,325; 13,000 ft., type 403, at $1,417; 16,000 ft., type 322, at $4,-944; 18,000 ft., type 325, at $6,426; 28,000 ft., type 325, at $7,140; 6,000 ft., type 306, at $1,080; 18,000 ft., type 401, at $4,458; 6,000 ft., type 403, at $680. STANDARD UNDERGROUND CABLE CO., Pittsburg, Pa., 3,000 ft., type 406, at $533; 37,000 ft., type 306, at $7,026; 3,000 ft., type 405, at $433. GENERAL ELECTRIC CO., Schenectady, N. Y., 21,000 ft., type 213, at $1,674; 8,000 ft., type 214, at $1,266; 19,500 ft., type 213, at $1,599; 26,700 ft., type 214, at $4,335.

WHARF.—New York, N. Y.—Bids were received as follows on Sept. 30 by the Constructing Quartermaster, Governor's Island, N. Y. H., for reconstruction and repairs to wharf at Governor's Island: John Anderson, West New Brighton, N. Y., $7,085; Edward B. Jenks Co., 143 Liberty St., New York, $6,000; Wm. H. Jenks, 59-61 Pearl St., New York, $9,292; H. McConklin & Son, Port Richmond, N. Y., $7,956; General Contract Co., P. O. Box 630, New Orleans, La., $9,-990; James O'Brien, 201 Baltic St., Brooklyn, N. Y., $8,887; The Phoenix Construction Co., 41 Park Row, New York, $6,500, Geo. Humphreys, 575-579 Clinton St., Brooklyn, $8,555; R. P. & J. H. Staats, 29 Broadway, New York, $7,950; Butler Bros., Hoff Co., 1170 Broadway, New York, $7,101; J. & F. Kelly, 15th St. and Hamilton Ave., Brooklyn, $7,857.

U. S. POSSESSIONS AND CUBA.

RAILWAY MATERIAL.—Panama.—Bids will be received until Nov. 9 by Capt. F. C. Boggs, Corps Engrs., U. S. A., General Purchasing Officer, Isthmian Canal Comn., at Washington, D. C., for furnishing according to Canal Circular 474 the following: Steel oil tanks, steel rail sections, rail clamps and keys, bridle bars, fish plates; repair parts for dump cars, locomotives, dredges and steam shovels; brass castings, screw plates, etc.

BOILER TUBES.—Panama.—Bids were received as follows on Oct. 22 by the General Purchasing Officer, Isthmian Canal Commission, Washington, D. C., for furnishing 12,-025 charcoal iron boiler tubes for the commission: Central Metal & Supply Co., Baltimore, Md., $22,940; Dietrich Bros., Baltimore, $23,671; Fox Bros. & Co., New York, $18,904; Griscom-Spencer Co., 90 West St., New York, $22,529; Handlan-Buck Mfg. Co., St. Louis, $24,304; Charles E. McInnes & Co., Philadelphia, $21,581; Motley, Green & Co., New York, $20,844; Pancoast, Rogers & Richards, 28 Platt St., New York, $21,078; United States Steel Products Export Co., 50 Church St., New York, $21,340.

DREDGES.—Panama.—Bids were received by Capt. F. C. Boggs, Corps Engrs., U. S. A., Gen. Purchasing Officer, Isthmian Canal Comn., on Oct. 16 for furnishing two clam-shell dredging machines with boilers (all deliveries at Colon or Cristobal). Lowest bidders were: Two hoisting engines, American Hoist & Derrick Co., St. Paul, Minn., $6,322, including two slewing engines; two boilers, stacks, breechings and accessories, Manning, Maxwell & Moore, 85 Liberty St., New York, $7,754; four spud anchors, the Moran Co., Seattle, Wash., $2,200; two derricks, the Moran Co., $4,200; three clam-shell buckets, the Moran Co., $2,200; one service pump, G. & W. Mfg. Co., 26 Cortlandt St., New York, $185; total, part, $25,682; delivery, 135 days.

POST-OFFICE, ETC.—San Juan, P. R.—Two bids were received on Oct. 19 by the Supervising Architect of the Treasury, Washington, D. C., for the construction of a post-office building at San Juan, P. R.: J. E. & A. L. Pennock, Philadelphia, $474,000; George A. Glenn & Co., Philadelphia, $370,-000. Time to complete, July 1, 1910.

Bids were asked by Maj. M. Gray Zalinski, Depot Quartermaster, Washington, D. C., and by the Constructing Quartermaster, San Juan, P. R., for the construction, electric wiring, and plumbing of a hospital building at San Juan. The only bid received at Washington, Oct. 19, was that of Gordon & Spavin, San Juan, P. R., on the plumbing at $4,450. No report has been received regarding the bids opened at San Juan.

ENGINEERING SUPPLIES. — Panama. — Bids were received as follows Oct. 26, by the Isthmian Canal Commission, Washington, D. C.: 3,000,000 lbs. foundry pig iron, No. 3: Berry & Aikens, 36th and Wharton Sts., Philadelphia, $33,000; Bethlehem Steel Co., South Bethlehem, Pa., $29,520; F. S. Bigler, Cleveland, Ohio, $27,000; R. W. Geldart, 2 Stone St., New York, $27,822; R. C. Hoffman & Co., Baltimore, $27,330; Frank Samuel, Harrison Bldg., Philadelphia, $22,-770; Southern Trading Co., New Orleans, $26,100; U. S. Steel Products Export Co., New York, $20,700.

(a) 15,000,000 lbs. hay, and (b) 1,000,000 lbs oats: American Hay Co., 25 Stone St., New York, (a) $15,731, (b) $21,500; Benedict Commission Co., Ltd., New Orleans, (a) $16,500; Early & Daniel Co., Cincinnati, (a) $17,250, (b) $21,300; Charles England & Co., Baltimore, (a) $15,937; Augustus Feiger & Co., Cincinnati, (a) $17,175, (b) $22,900; J. M. Frisch & Co., Baltimore, (a) $15,937, (b) $21,700; Jockusch, Davison & Co., Galveston, Tex., (a) $16,950, (b) $20,300; W. R. Grace & Co., San Francisco, (b) $21,500; Henry B. Schreiber & Bro., New Orleans, (a) $18,-000, (b) $20,800; Woodward Wight & Co., Ltd., New Orleans, (a) $17,700, (b) $20,800.

8,000 creosoted bridge ties: G. Elias & Bro., Buffalo, N. Y., $16,704; West Pascagoula Creosote Works, Gautier, Miss., $14,-592; Gulfport Creosoting Works, Gulfport, Miss., $18,048.

For other Proposal Advertisements see pages 47, 48, 49, 51, 52, of Advertisements and Construction News page 156.

WATER WORKS.

Wenatchee, Wash.

Sealed proposals will be received by the City Clerk at his office in the City of Wenatchee, Washington, up to 12 o'clock M., November 24th, 1908, for the construction and completion of certain additions to and extensions of the existing water-works owned and controlled by the City of Wenatchee. The work will consist of constructing a pumping station on the banks of the Columbia River at the foot of Fifth Street North and construction of a pipe tunnel from pumping station to junction with the existing tunnel.

Furnishing pump, motor and starting panel.

Pipe line to reservoir.

Reservoir complete, including coping and iron fence.

Overflow pipe from reservoir.

Bids may be for the entire work as set forth in the plans and specifications or for any of the several divisions of the work set forth in the plans and specifications.

Bids must be endorsed on the envelope, "Bid for constructing additions to the City Water-Works of the City of Wenatchee."

All proposals must be upon the blank forms provided by the City of Wenatchee.

A certified check for 5% of the amount of bid must accompany each bid and no bid will be considered unless accompanied by such check.

The City reserves the right to reject any and all bids.

All bidders receiving a copy of the plans and specifications must deposit $15 for the return of same.

For further information apply to

ROY ZAHREN,
City Engineer.
or SAM R. SUMNER,
City Clerk.

Dated this 21st day of October, 1908.

PAVING.

Ashland, Ky., Oct. 24, 1908.

Sealed proposals will be received by the City Clerk of the City of Ashland, Kentucky, up to 7:30 P. M., Monday, November 9th, 1908, for the furnishing of all materials for and the construction of vitrified brick pavements, concrete curb and gutter and concrete headers in the said City as per plans and specifications approved by the City Council of the City of Ashland, and on file in the office of the City Engineer. The approximate quantities are:

44,540 sq. yds. paving.

21,000 lineal feet combined curb and gutter and necessary catch basins for same.

8,500 lineal feet concrete headers.

Specifications and blank forms of bids will be furnished on application to J. W. Bosley, City Engineer.

A certified check on a National Bank, payable to L. R. Putnam, City Treasurer for the sum of One Thousand ($1,000.00) Dollars must accompany each proposal. The right is reserved to reject any and all bids.

Mark bids for Street Paving and address same to E. A. Shepard, City Clerk of the City of Ashland, Kentucky.

J. O. MATHEWSON, Mayor.
E. A. SHEPARD, City Clerk.
L. R. PUTNAM, City Treasurer.

ENGINES AND PUMP.

TO WHOM IT MAY CONCERN.

Warren, Pa.

Please notice that sealed bids will be received by the Committee designated by the Board of Trustees of the State Hospital for the Insane at Warren, Pa., for the furnishing and installing of two (2), eighty (80) Brake Horse-Power Natural Gas Engines; and for the furnishing and installing of two (2) Triplex Power of approximately 955 gallons per minute capacity. Plans and specifications will be furnished by the Engineer, Charles R. Simpson, at "State Hospital, Warren, Pa." and information given to those who desire to bid. All bidders are required to send with bid a certified check for the sum of $500.00 to ensure good faith on their part. Bids will be received up to 3:00 P. M. on the 17th of November, 1908.

DREDGING AND TILE DRAIN.

Burl[illegible], Ia.

1. Sealed bids will be rec[illegible] by the Joint Board of Supervisors [illegible] Louisa County and Des Moines Coun[illegible]tate of Iowa, acting for and on be[illegible] of the Louisa-Des Moines Drainag[illegible]District Number 4 of said counties, [illegible] office of the Auditor of Des Moi[illegible]ounty, Burlington, Iowa, until two o[illegible] P. M., November 14th, A. D. 1908, at [illegible]h time and place said bids will [illegible]ublicly opened. The work for whi[illegible]is are asked is a part of the drainag[illegible]em of said Drainage District as follo[illegible] viz.:

Section 1 Excavation ...200,0[illegible] yds.
Section 2 Excavation ... 17,4[illegible] yds.
Section 3 18-in. tile drain 8,20[illegible]al feet
15-in. tile drain 2,40[illegible]al feet

as described in detail in the [illegible]ifications therefor on file with the [illegible]or of each of said counties.

2. Each bid must be accom[illegible]ed by cash or certified check equal to ten per cent. of the amount of the bid.

3. Plans and specifications are on file and may be seen at the office of the County Auditor of Louisa County, Wapello, Iowa; at the office of the County Auditor of Des Moines County, Burlington, Iowa, and at the office of the Harman Engineering Co., Engineers, 129 Fredonia Ave., Peoria, Illinois. Copy of Specifications, Form of Contract and Form of Bid may be procured by application to the Engineers.

D. H. V. HERRICK,
O. C. FARMER,
R. S. JOHNSON,
Supervisors of Louisa County.
Joint Board.

A. SCHWALLER,
R. D. SIEFKEN,
JOHN H. PETTIBONE,
Supervisors of Des Moines County.

DAN P. HILL, County Auditor,
Des Moines County.

H. W. BAKER, County Auditor,
Louisa County.

HARMAN ENGINEERING CO.,
Engineers.

OFFICE OF COMMISSIONERS, District of Columbia, October 24, 1908.—Sealed proposals will be received at this office until 12 o'clock noon, November 16, 1908, for constructing Section D of the East Side Intercepting Sewer, Boundary to Brookland, District of Columbia. Forms of proposals, specifications, and necessary information may be obtained from Chief Clerk, Engineer Department, Room 427 District Building, Washington, D. C. HENRY B. F. MACFARLAND, HENRY L. WEST, JAY J. MORROW, Commissioners, D. C.

OFFICE, COMMISSIONERS, District of Columbia, Oct. 26, 1908.—Sealed proposals will be received at this office until 12 o'clock noon, Nov. 16, 1908, for constructing service sewers in Conduit Road, District of Columbia. Forms of proposals, specifications, and necessary information may be obtained from Chief Clerk, Engineer Department, Room 427, District Building, Washington, D. C. HENRY B. MACFARLAND, HENRY L. WEST, JAY J. MORROW, Commissioners, D. C.

TREASURY DEPARTMENT Office of the Supervising Architect, Washington, D. C., October 20, 1908.—Sealed proposals will be received at this office until 3 o'clock P. M., on the 27th day of November, 1908, and then opened for the construction complete of the U. S. Post-office at Milford, Del., in accordance with the drawings and specifications, copies of which may be had at this office or at the office of the Postmaster at Milford, Del., at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect.

Situations Wanted

MECHANICAL ENGINEER, M. I. T. graduate; 3 years' experience installation and design of conveying, elevating and marine machinery, and 2 years design D. C. electrical apparatus; desires position as designer or engineer. Address "P. 18," Engineering News, New York. 18-1t

Situations Open

WANTED—Draftsman, technical graduate experienced in design of railroad bridges, shops, round-houses and other buildings. Vertical letterer preferred. Salary, one hundred to one twenty-five. Give education, experience in full, date could report, and enclose sample of work. Railroad now under construction in middle South. Address ENGINEER B. & B., C., C. & O. RY., Johnson City, Tenn. 18-1t

WANTED—A Mechanical Engineer with thorough experience in lines which will fit him for designing machinery for swing bridges and bascule bridges. Thorough engineering education essential. Shop experience desirable. State age, education, experience, and salary required. Address "R. 18," Engineering News, New York. 18-1t